

# **EFR summary**

International Economics, FEB12004  
2025–2026



Lectures 1 to 11  
Weeks 1 to 4

**Deloitte.**

DeNederlandscheBank  
EUROSYSTEEM

## Details

**Subject:** International Economics IBEB 2025–2026

**Teacher:** Maarten Bosker, Julian Emami Namini

**Date of publication:** 23.11.2025

© This summary is intellectual property of the Economic Faculty association Rotterdam (EFR). All rights reserved. The content of this summary is not in any way a substitute for the lectures or any other study material. We cannot be held liable for any missing or wrong information. Erasmus School of Economics is not involved nor affiliated with the publication of this summary. For questions or comments contact [summaries@efr.nl](mailto:summaries@efr.nl)

---

# 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
- $T_{ij}$ : the value of trade between country i and j
- $Y_i$ : GDP of country i
- $Y_j$ : GDP of 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; 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 quickly) 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**

## Two important recent developments

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

# International Trade – IBEB – Lecture 2, week 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

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
- **Heckscher-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 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
- Colombia 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                   |
| 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

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

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

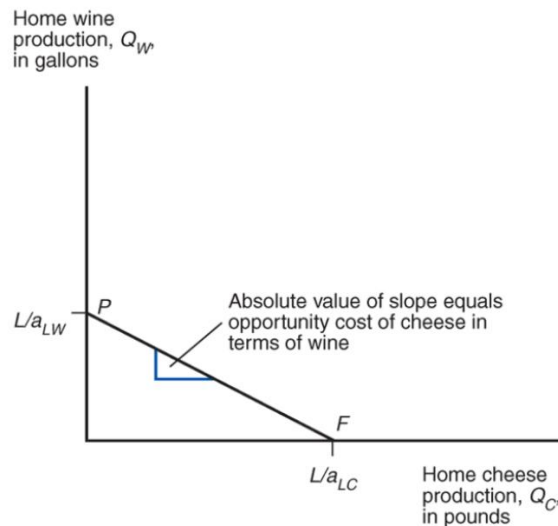
- $L$  = total number of hours worked (constant by assumption)
- $Q_C$  = how many pounds of cheese are produced
- $Q_W$  = how many gallons of wine are produced
- $a_{LC}$  = the unit labour requirement for cheese
  - ~  $a_{LC} = 1$  means that 1 hour of labor produces one pound of cheese
- $a_{LW}$  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:

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



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 seen 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

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

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

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

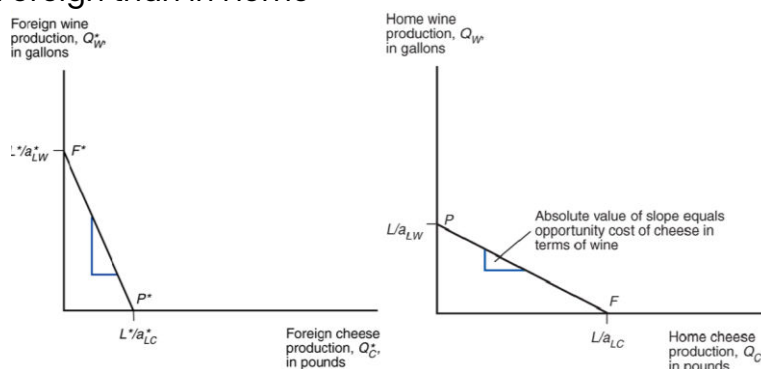
$$\frac{a_{LC}}{a_{LW}} < \frac{a_{LC}^*}{a_{LW}^*}$$

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 seen 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:

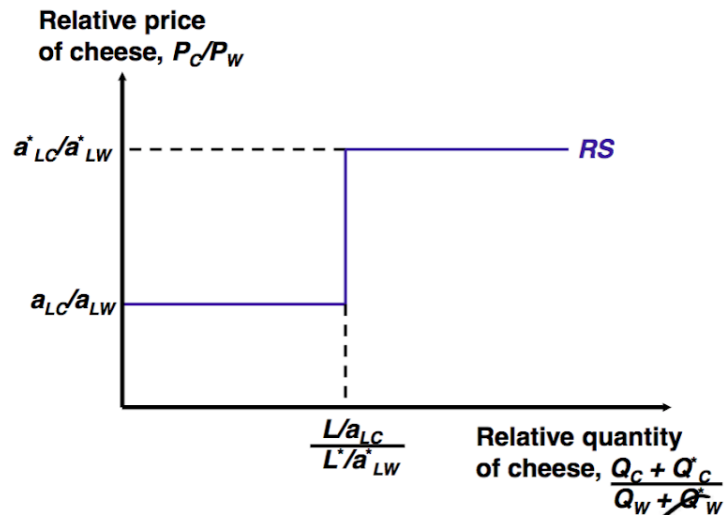
- It helps us determine how much trade will be observed, and how much the 2 countries benefit from it
- We begin by defining the world relative supply and the world relative demand for the 2 goods

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

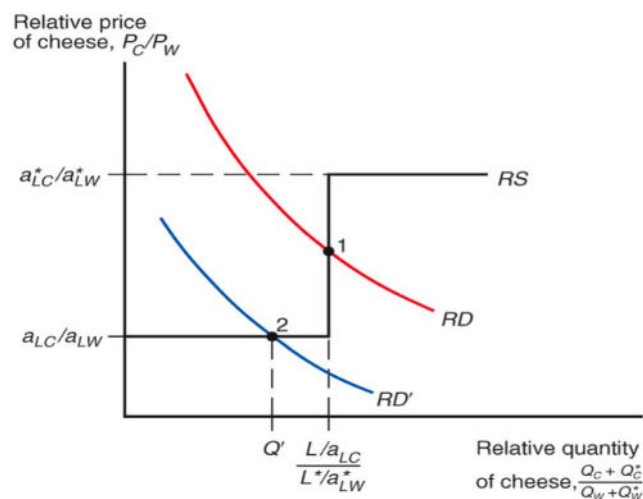
$$RS = \frac{Q_C + Q_C^*}{Q_W + Q_W^*}$$

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**  $\frac{P_C}{P_W} < \frac{a_{LC}}{a_{LW}} < \frac{a_{LC}^*}{a_{LW}^*}$
- If the relative price is above the opportunity cost of cheese in both countries, they both will be eager to supply cheese, **RS = ∞**  $\frac{P_C}{P_W} > \frac{a_{LC}}{a_{LW}} > \frac{a_{LC}^*}{a_{LW}^*}$
- 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 ≤ RS ≤ (L/a<sub>LC</sub>) / (L\*/a<sub>LW</sub><sup>\*</sup>)**  $\frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}} < \frac{a_{LC}^*}{a_{LW}^*}$
- 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/a<sub>LC</sub>) / (L\*/a<sub>LW</sub><sup>\*</sup>) ≤ 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/a<sub>LC</sub>) / (L\*/a<sub>LW</sub><sup>\*</sup>)**  $\frac{a_{LC}}{a_{LW}} < \frac{P_C}{P_W} < \frac{a_{LC}^*}{a_{LW}^*}$



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



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

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

# International Trade – IBEB – Lecture 3, week 1 (International Trade 3)

## Differences in technology: The Ricardian model – continued

### Gain 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.

### Prove of Gains from trade

With trade, workers have the **same purchasing power in the goods they produce** but it's **higher for the other good**, making them better off overall. Specifically:

#### 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 seen 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

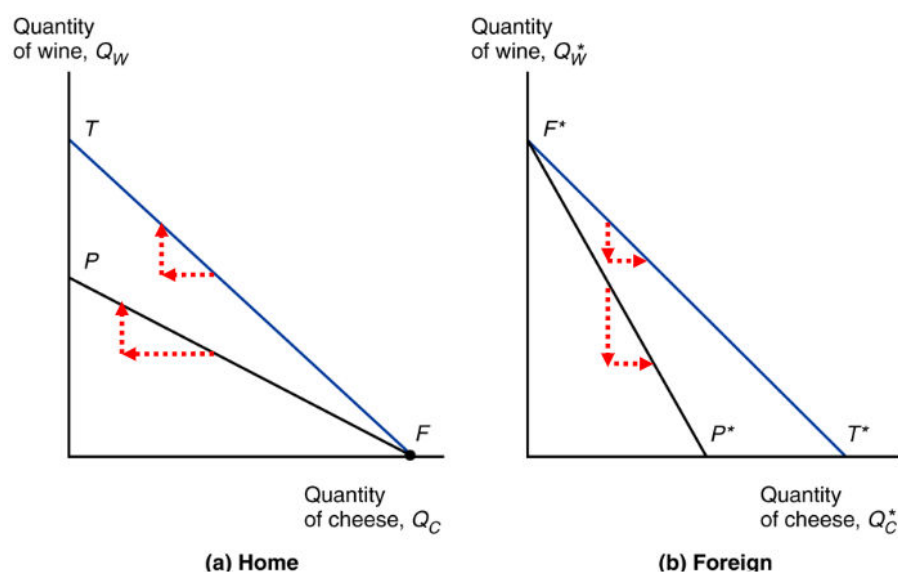
The **same analysis** can be done with the **foreign country**, and we will see a similar outcome, where  $\frac{P_C^*}{P_W^*} > \frac{P_C^{World}}{P_W^{World}}$  or  $\frac{P_W^*}{P_C^*} < \frac{P_W^{World}}{P_C^{World}}$

- 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 | $a_{LC} = 1 \text{ hour/pound}$   | $a_{LW} = 2 \text{ hour/gallon}$   |
| Foreign  | $a_{LC}^* = 6 \text{ hour/pound}$ | $a_{LW}^* = 3 \text{ hour/gallon}$ |

Without trade:

- $\frac{P_W}{P_C} = \frac{a_{LC}}{a_{LW}} = \frac{1}{2}$ , and  $\frac{P_W^*}{P_C^*} = \frac{a_{LC}^*}{a_{LW}^*} = \frac{2}{3}$
- **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:  $\frac{w_C}{w_W^*} = \frac{P_C^{World}}{P_W^{World}} \cdot \frac{a_{LW}^*}{a_{LC}}$

Given that

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

$$- \frac{w_C}{w_W^*} = \frac{P_C^{World}}{P_W^{World}} \cdot \frac{a_{LW}^*}{a_{LC}} \rightarrow \frac{w_C}{w_W^*} < \frac{P_C^*}{P_W^*} \cdot \frac{a_{LW}^*}{a_{LC}} \rightarrow \frac{w_C}{w_W^*} < \frac{a_{LC}^*}{a_{LW}^*} \cdot \frac{a_{LW}^*}{a_{LC}}$$

$$- \frac{w_C}{W_W^*} < \frac{a_{LC}^*}{a_{LC}}$$

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

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

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

- $a_{LW}^* = 3$ ,  $a_{LC}^* = 6$ ,  $a_{LW} = 2$ ,  $a_{LC} = 1$
- 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,  $12 \cdot 2 = 24$ , but Foreign  $4 \cdot 3 = 12$

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

- Home country's unit labour requirement for each good is  $a_{Li}$
- Foreign country is  $a_{Li}^*$ .

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

- Comparative advantage is based on the opportunity cost, which is based on one good in terms of the other
- 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 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.

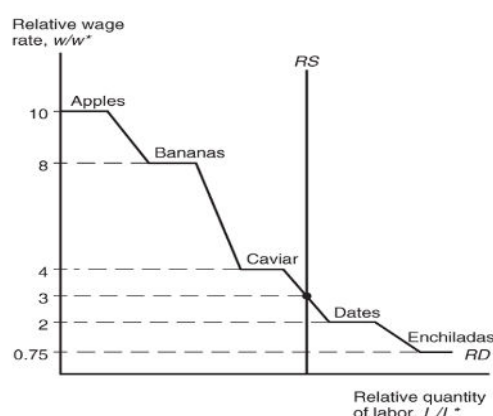
We can use the table above to illustrate:

If  $w/w^*$  rises to 3.5:

- Home still produces apples, bananas and caviar,
- but they become relatively more expensive  $\Rightarrow$  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 studies show that countries tend to export goods in which their relative productivity to other goods is high.
2. Many economies with an absolute disadvantage in all industries can still have major exports thanks to comparative advantage in one.
3. Research was also able to link the Ricardian model and the theory of comparative advantage with the reality of the agricultural sector. This verifies that comparative advantage does determine production patterns.

## 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

# 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 seen 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**, **labour** and **capital**
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

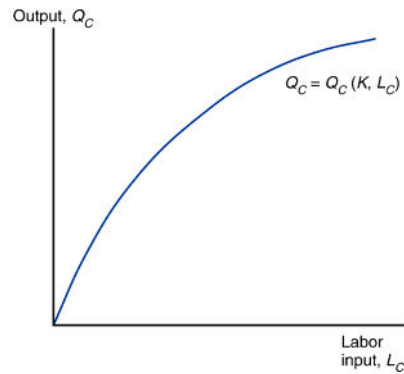
A production function is a graphical representation of the output of a good that can be produced with different input bundles of the factors of production. The production function of car and food can be represented as:

- $Q_c = Q_c(K, L_c)$

- $Q_F = Q_F(T, L_F)$

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.

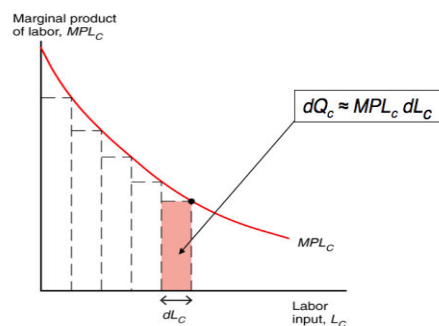
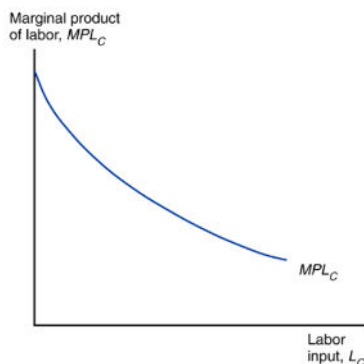


The graph shows **diminishing marginal return to labour**, meaning:

- Additional unit of labour increases Output, but at a rate lower than before
- With constant capital, increasing the N° 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

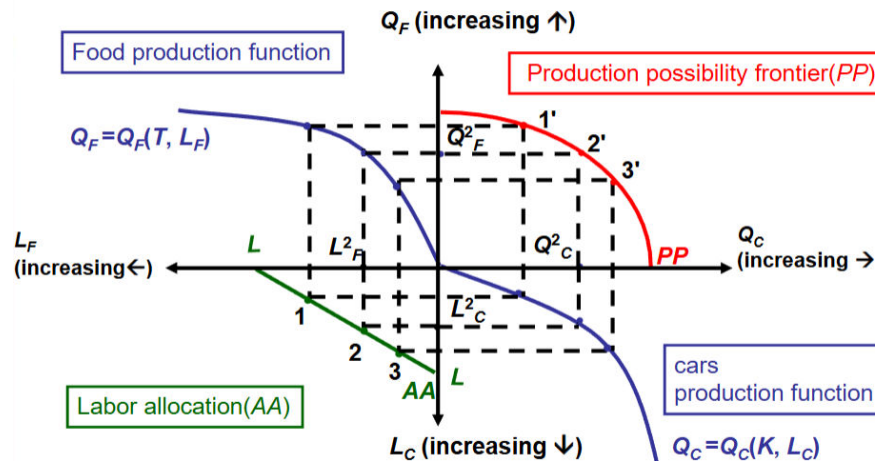


**Note:** The area under the marginal product curve represents output  $Q_C$ .

- 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  $\frac{1}{MPL_C}$  units of labour
- If we were to use the  $\frac{1}{MPL_C}$  units of labour used to produce 1 car, we would have been able to produce  $\frac{MPL_F}{MPL_C}$  units of food

$MPL_F$  food produced with 1 unit of labour, times the labour freed up from cars  $\frac{1}{MPL_C}$ ,  $MPL_F \cdot \frac{1}{MPL_C}$

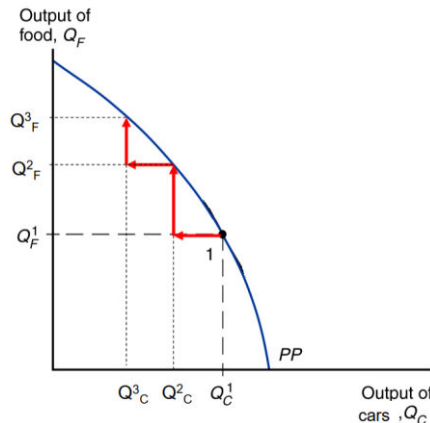
- This is the opportunity cost of producing 1 extra unit of cars in terms of food

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  $Q^3_C$  to  $Q^2_C$  of cars, you go from making  $Q^3_F$  to  $Q^2_F$  of food, and for the same increase in cars, you go from making  $Q^2_F$  to  $Q^1_F$ , 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  $L$ :

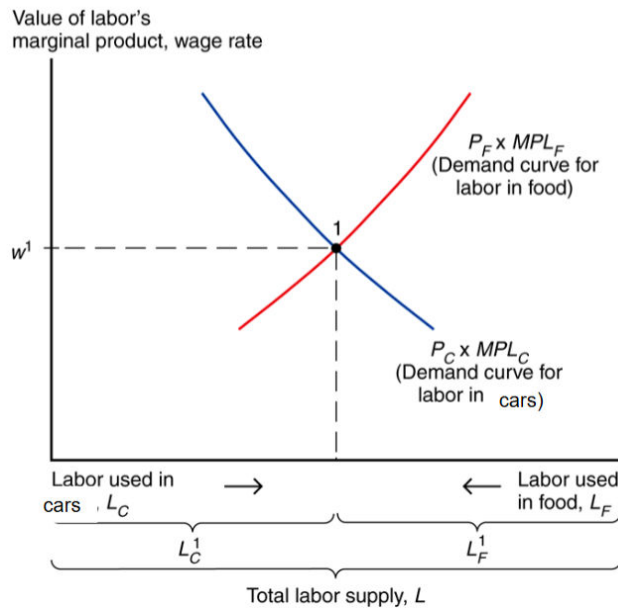
$$w_C = P_C \cdot MPL_C$$

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 they add to total output. The representation of both the labour demand curves



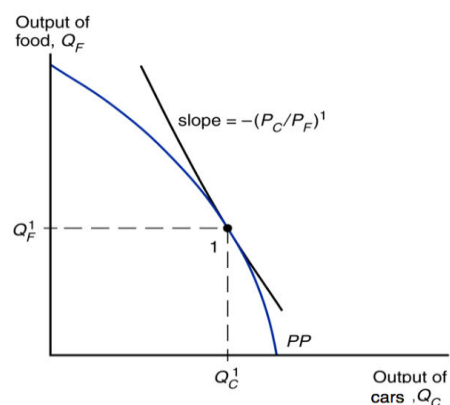
Where the labour demand curves intersect is the equilibrium wage and allocation of labour between the two sectors.

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

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

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

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)



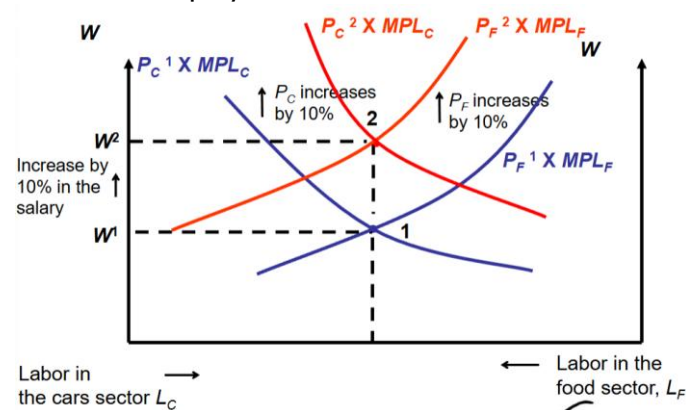
# Proportional and relative change in prices

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.

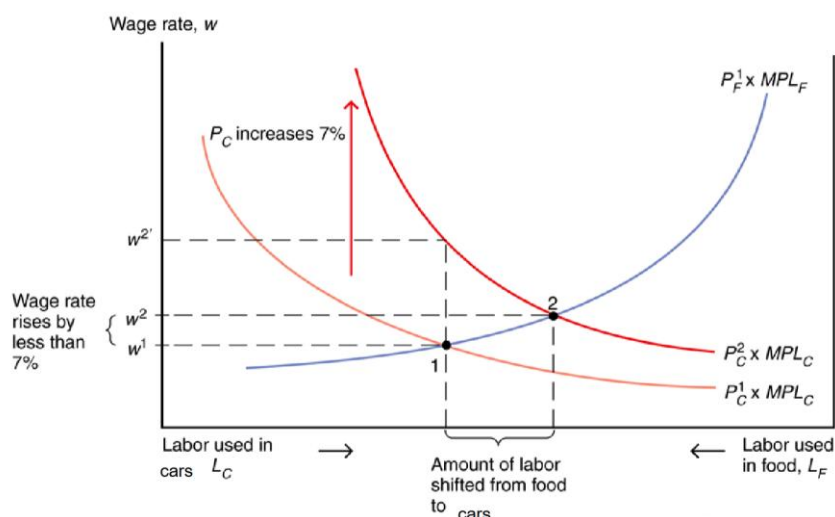
If both prices increase by 10%, the demand for both car and food rises.

- 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

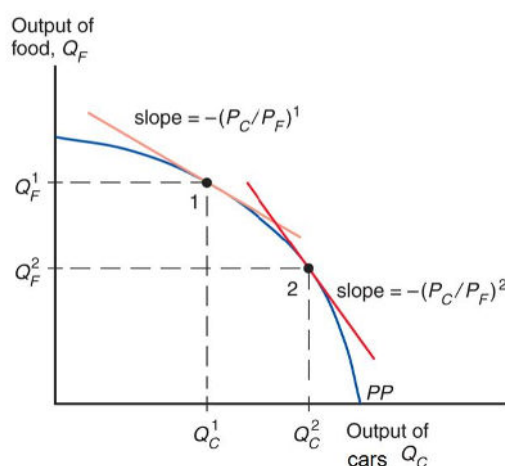


A **change in relative prices**: when the price of either or both goods change with **different** magnitudes.

- 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%.
- 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 car increases, wages rise by less than the rise in price of car, so they earn more; relative price of car increases, so they have more purchasing power of food.
2. **Landowners are worse off:** output of food declines, wages rise while price of food is unchanged, so they earn less; relative price of car increases, so they have less purchasing power of car.
3. **Ambiguous for workers:** Wages go up, but
  - a. Price of cars has gone up even more, so that 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

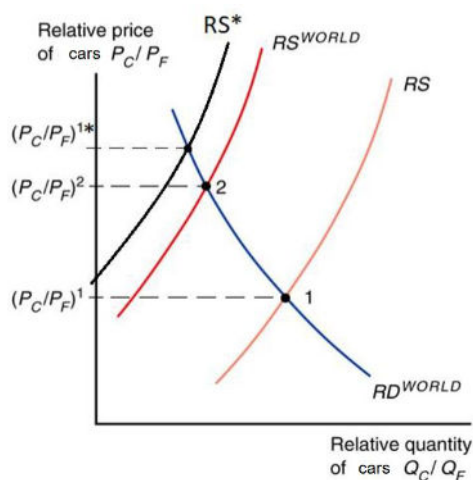
Assume Foreign is willing to produce relatively less car at a given relative price.

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

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:

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

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

After permitting trade, it is possible to produce more/less than consumption and export/import the remaining quantity.

- Assuming lending or borrowing internationally is not possible, thus only what is earned can be spent:

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

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

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

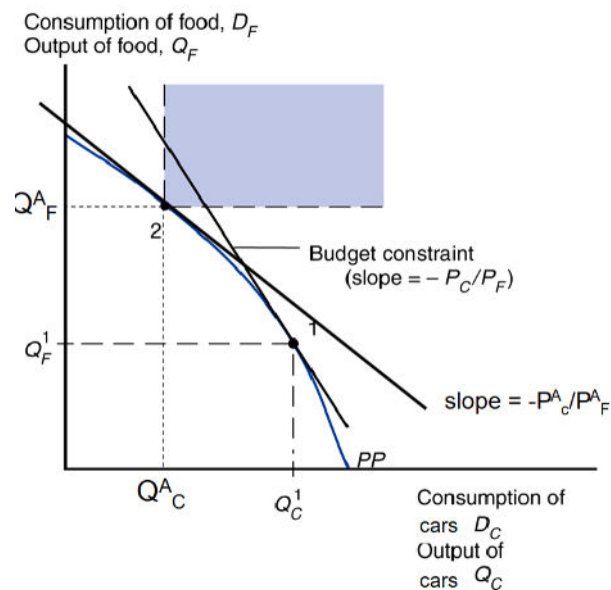
- If Home sells one more unit of cars on world markets it gets  $P_C$  for it, with this money it can buy  $\left(\frac{P_C}{P_F}\right)$  units of food in return

In Autarky it produces and consumes  $Q_{AF}$  and  $Q_{AC}$

- With trade it produces  $Q_{1F}$  and  $Q_{1C}$

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

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

Effect can be larger because

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

- Opening to trade may lead to an increase in short-run unemployment

## The Political Economy of Trade

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

# International Trade – IBEB –

## Lecture 5, 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:

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

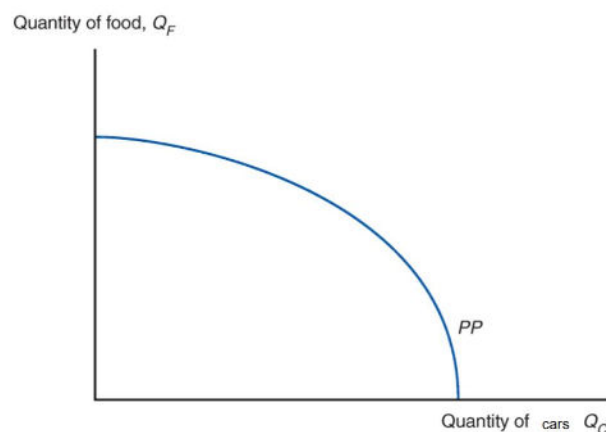
The production function is characterised by diminishing returns to labour and capital

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**.

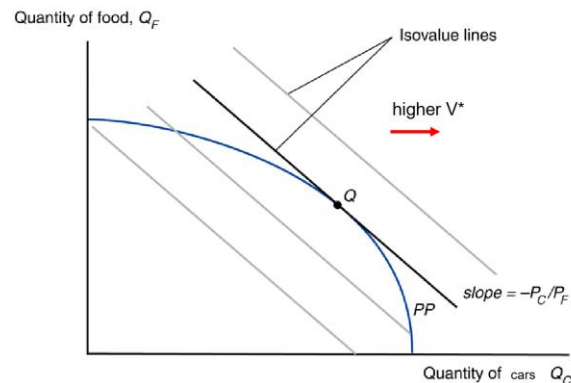
$$V^* = P_C \cdot Q_C + P_F \cdot Q_F \Leftrightarrow Q_F = \frac{V^*}{P_F} - \left(\frac{P_C}{P_F}\right) \cdot Q_C$$

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.

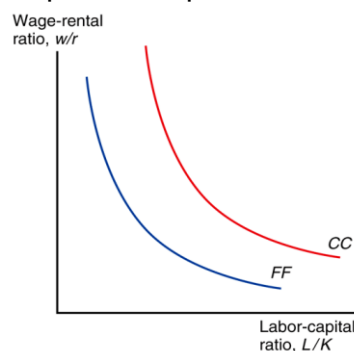
- Here, the relative price of car to food equals the opportunity cost.
- If relative price of cars in terms of food  $>$  opportunity cost of producing cars in terms of food:
  - Incentive to produce a bit more cars, selling them for food
- If relative price of cars in terms of food  $<$  opportunity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

- 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

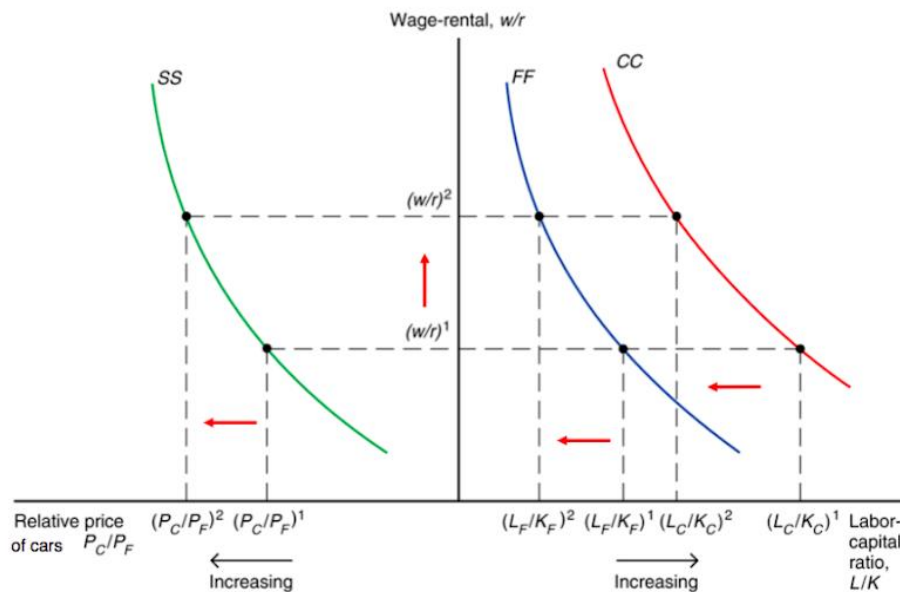


Suppose the relative price of car to food increases, some firms will switch to producing car to earn more.

- 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 then changes 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

- 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  $\frac{L_c}{L_f}$  and  $\frac{K_c}{K_f}$  remain unchanged. This can be explained as follows:

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

$$\frac{L}{K} = \left(\frac{L_c}{K}\right)\left(\frac{K_c}{K_c}\right) + \left(\frac{L_f}{K}\right)\left(\frac{K_f}{K_f}\right) \rightarrow \frac{L}{K} = \left(\frac{L_c}{K_c}\right)\left(\frac{K_c}{K}\right) + \left(\frac{L_f}{K_f}\right)\left(\frac{K_f}{K}\right)$$

Note  $\left(\frac{K_c}{K}\right)$  is just the share of capital allocated to cars, so  $\left(\frac{K_c}{K}\right) + \left(\frac{K_f}{K}\right) = 1$

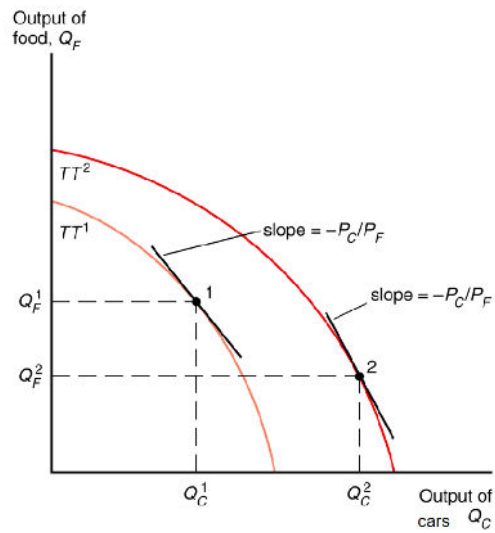
- In other words, one share going up means the other goes down by equal amount
- We have also assumed that car is labour-intensive, so  $\frac{L_c}{K_c} > \frac{L_f}{K_f}$

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 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, 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

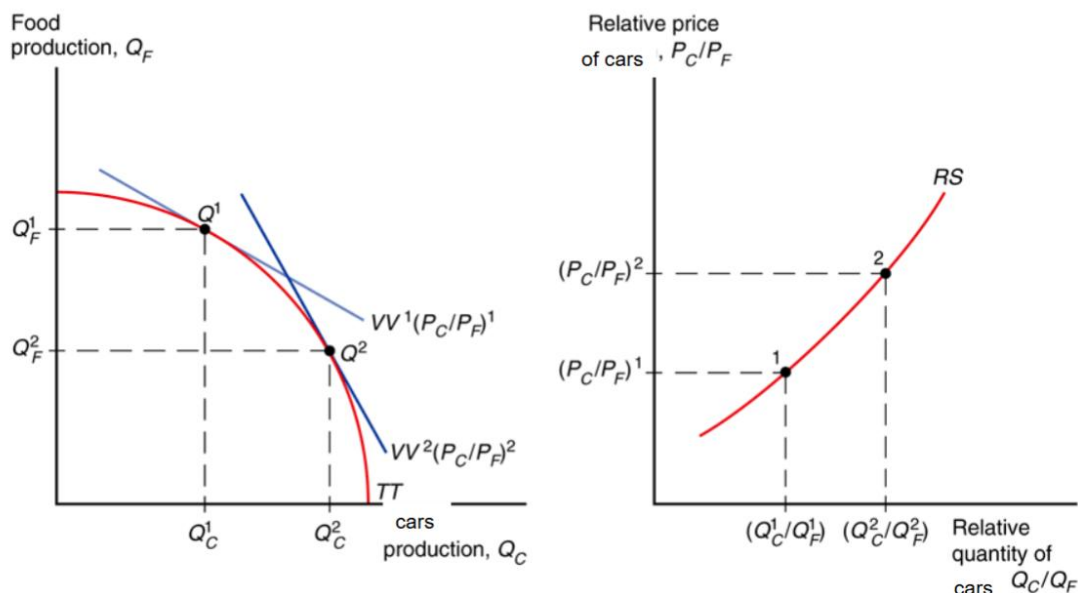
## Production – relative supply

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 loci of these points when plotted with axes of relative price and relative quantity represent the relative supply.

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

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



## Consumption – relative demand

**Relative demand curve** is determined by

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

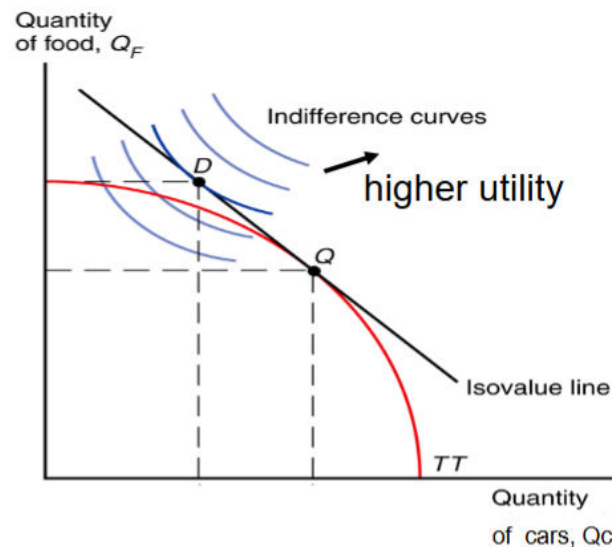
These Indifference curves:

- 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:

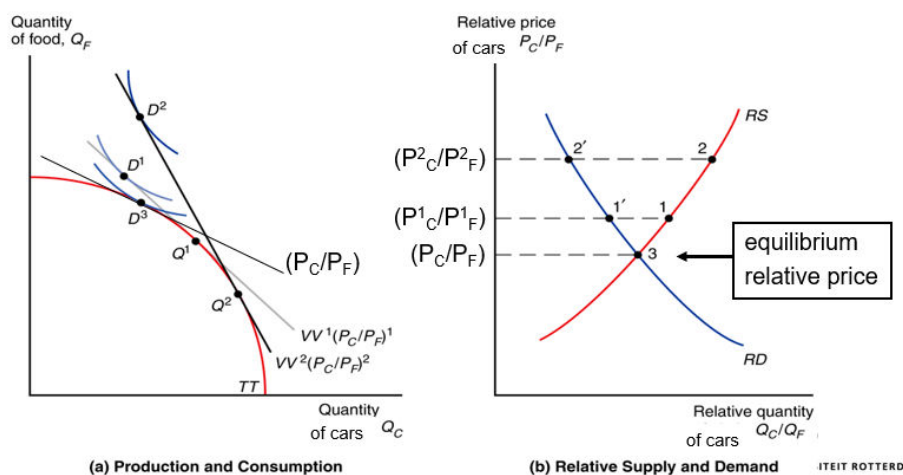
- Given the shown relative prices, consumers would like to consume more food and less cars than what the country's producers can produce (D is outside the PPF)



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 up to trade

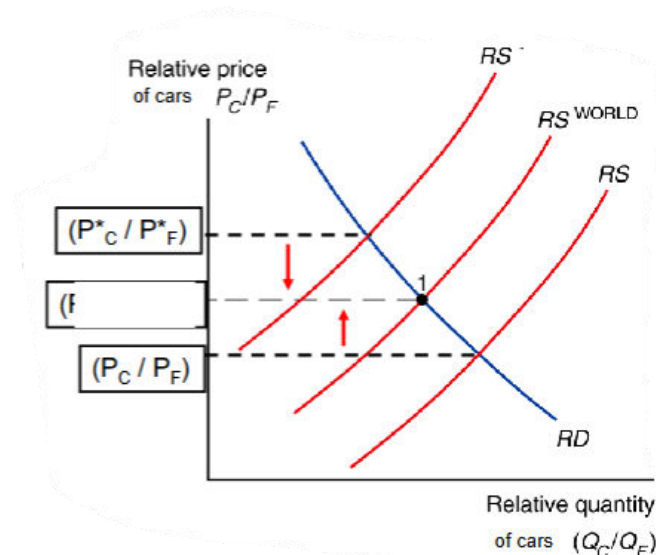
We assume that the whole world consists of two countries, Home and Foreign.

- 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.

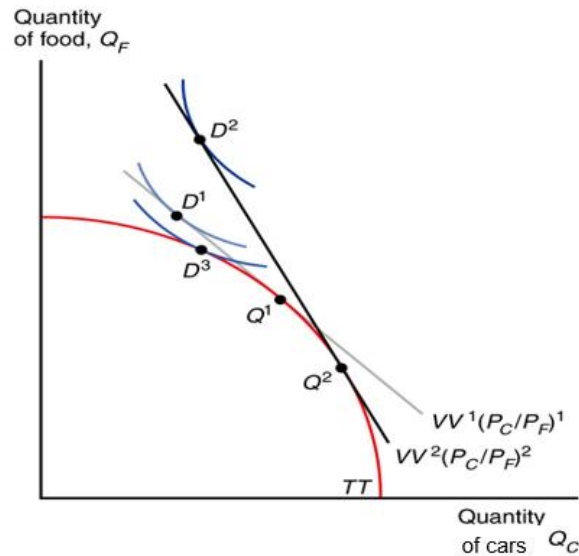
- Based on the assumption that Home is relatively more efficient in producing car and Foreign is relatively more efficient in food
- At any given relative price of car, Home always produces more car relative to food and Foreign produces a lower quantity of cars to food (a higher quantity of food to car):  $\frac{Q_C}{Q_F} > \frac{Q_C^*}{Q_F^*}$
- **Home export 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 lie in between the Home's and Foreign's supply curve

- Relative price of car to food between Home and Foreign will converge.

Home is more efficient in producing cars, so when it opens up to trade, the relative price of cars goes up.

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

## 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 ( $D1 \Rightarrow D2$ ) of cars

Effect due to rise in relative price of cars:

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

## Terms of trade and welfare

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

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

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 higher relative price of car, steeper the isovalue line, so reaches higher indifference curve, in our example  $D1 \rightarrow D2$
- 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

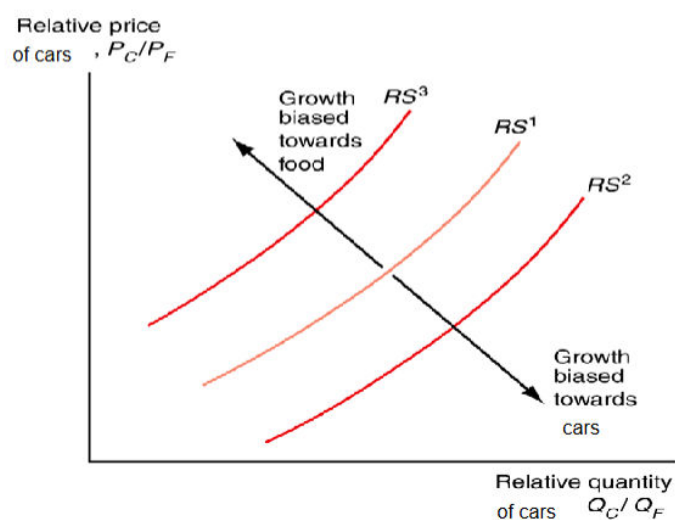
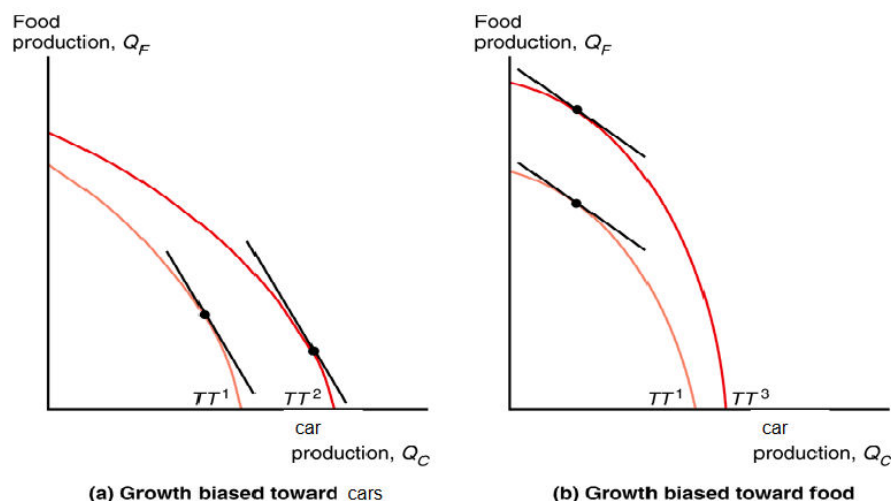
The Standard Trade model gives us clear predictions about the gains from trade, and the impact of changes in the terms of trade on welfare

- 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 lead to a biased growth of the sector that uses this factor intensively.



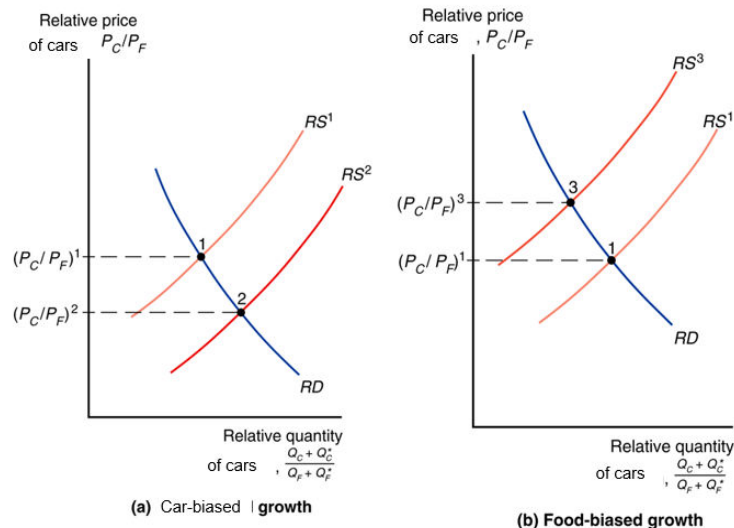
As you can see from the graphs above **in autarky, economic growth is always positive** as it improves welfare by expanding production, thus consumption possibilities.

- 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 effect above are **only partial** to know the **overall effect** of economics 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 world, while the developing Asian economies are witnessing worsening terms of trade due to export-biased growth domestically.

## Effects of import tariffs and export subsidies

**Import tariff** is a tax on the price of imports.

**Export subsidies** are grants provided by the government to export businesses in order to support, stimulate and protect the exports.

- Both 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  $P^D = P^{World} \left(1 + \frac{T}{100}\right)$ , 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  $P^{World}$ .

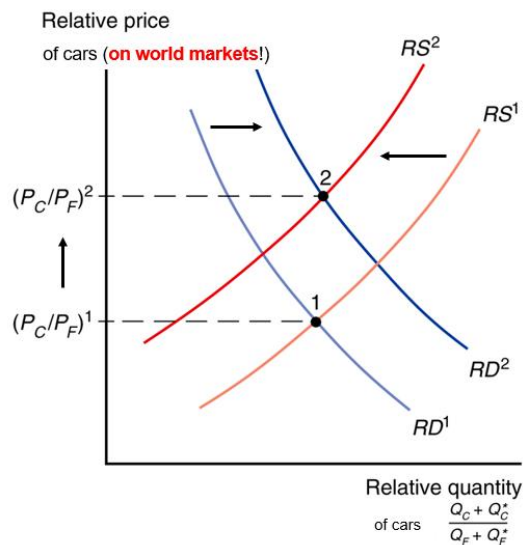
- When they export, they get  $P^{World} \left(1 + \frac{S}{100}\right)$ , when they sell domestically they get  $P^D$ ,
- so, for producer to also sell domestically we need  $P^D = P^{World} \left(1 + \frac{S}{100}\right)$ , as you can see it's higher than the world price

## Effects of import tariffs

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.

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



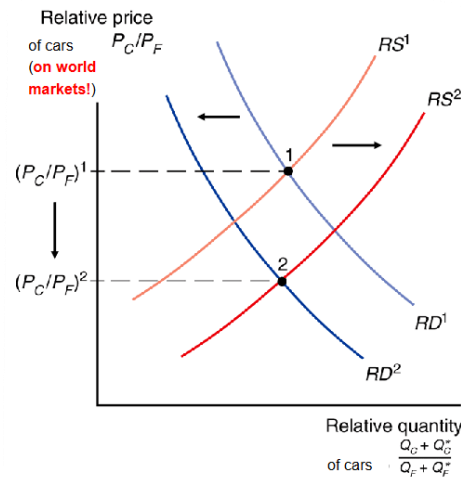
The tariff on food imports in Home drops the world relative price of food and thus raises the world relative price of cars.

- Since Home is a food importer and a car exporter, this elevates Home's terms of trade, while at the same time dropping Foreign's terms of trade.
- As a result, Home's welfare increases and Foreign's welfare decreases.

## 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

**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 endowment 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 mostly external, there will be **a lot of small firms** approaching an environment of **perfect competition**.

**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.

## Labour pooling

A large and concentrated industry will attract a pool of workers, thus reducing the search and hiring cost for each of the firms.

- This concentration is self-reinforcing as individuals in search for (well-paid) job in that industry will automatically relocate there.
- Eventually, both employers and employees benefit.

## Knowledge spillovers

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

## 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, as it's external, we will have **many small firms** which approaches **perfect competition**
- Thus, **prices reflect production costs**

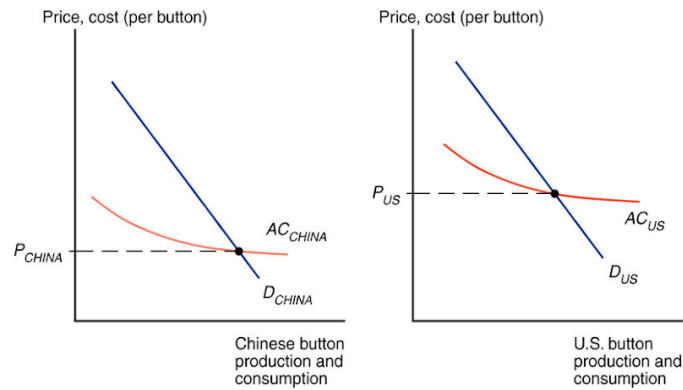
The **larger the industry**, the **lower the prices** firms charge consumers for their products

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.

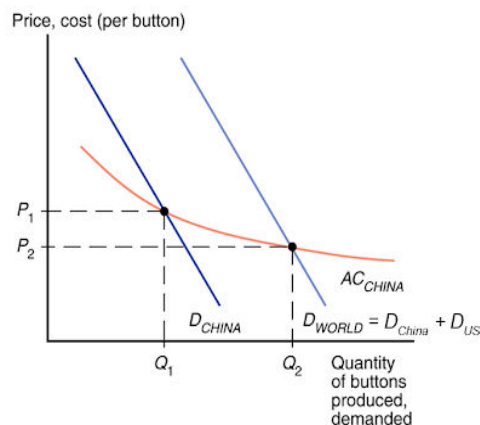
As you can see in the graph below prices in each country is determined by supply and demand in each of the 2 countries



## 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 still 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?

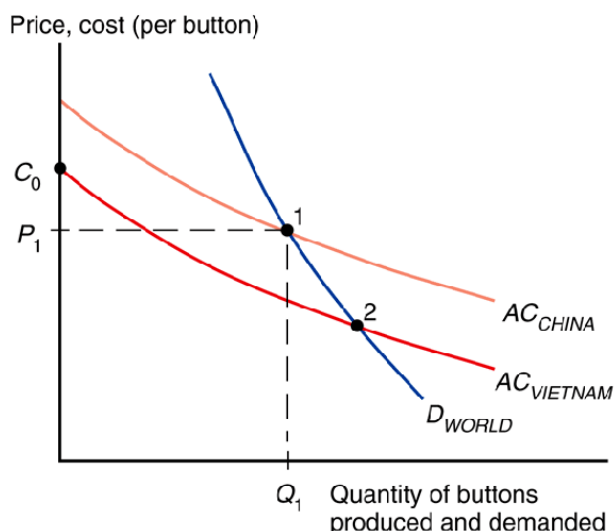
## Important implications of External economies of scale

However, just because the country is 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

- Follow our previous analogy Vietnam should supply the button 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.  $P_1$ )



## Gains from trade

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

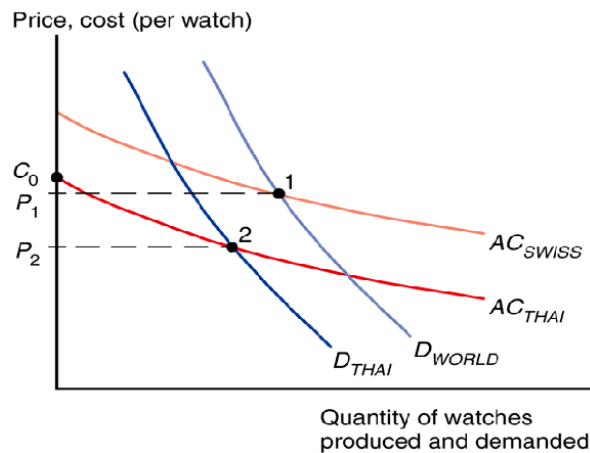
- Most of the time, only one country specialises in the production of a good such that the prices are lowest.
- However, there is also a possibility that individual countries are better off in autarky since they are naturally more efficient in a good production.

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

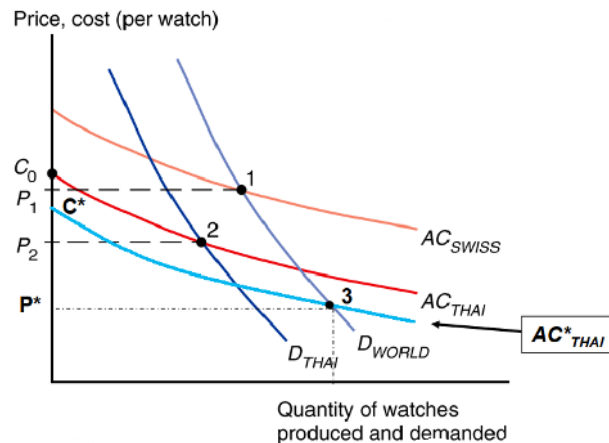
Suppose Thailand decides to impose very high trade barriers, that makes them go back to autarky,

- In principle this, lowers the price of watches  $P_1 > P_2$
- Incentive to protect its own industry



Suppose now Thailand is even better, and even the first watch cost less than the Swiss with economies of scale,

- There will be a rapid change in the in the location of production
- Watch production move completely to Thailand



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.

There have been arguments in regard to the learning curve.

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

External economies of scale are also applicable to **interregional trade**, though differences in endowments are much lower and the factors mobility is very high.

- Thus, increasing returns to scale is even more important in shaping domestic specialisation and trade patterns.
- One thing to note is that even within domestic borders, there are still many **non-tradable services and goods**.
- We can recognize this from the similar share of employment in different non-tradable sectors across regions.
- On the other hand, the tradable good production is highly concentrated and localised, typically due to the lock-in from geography, policies, or historical coincidences.

# International Trade – IBEB – Lecture 9, week 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**

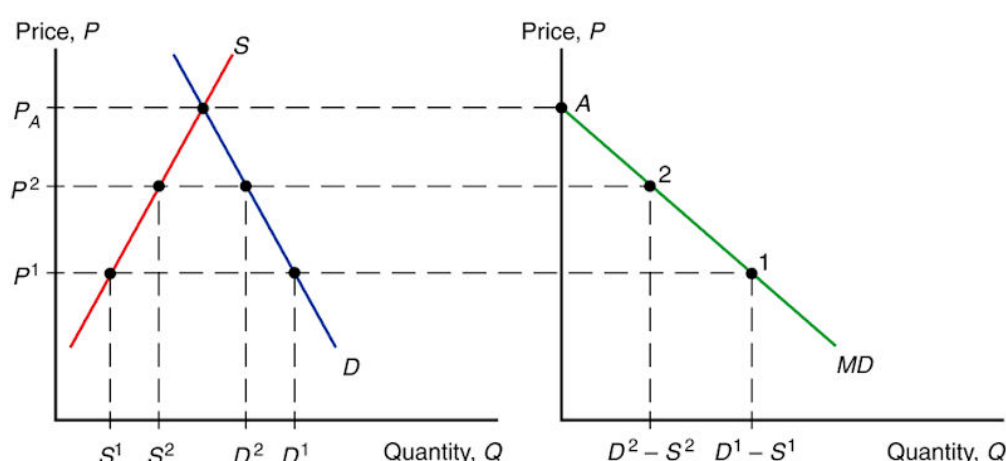
We now analyse the effects, when home starts imposing **import tariffs on cars**

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,

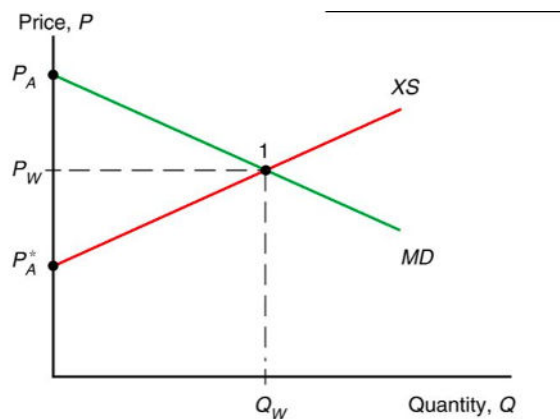
**Home import demand = Foreign export supply**

Home demand – Home supply = Foreign supply – Foreign demand

Home demand + Foreign demand = Foreign supply + Home supply

**World demand = World supply**

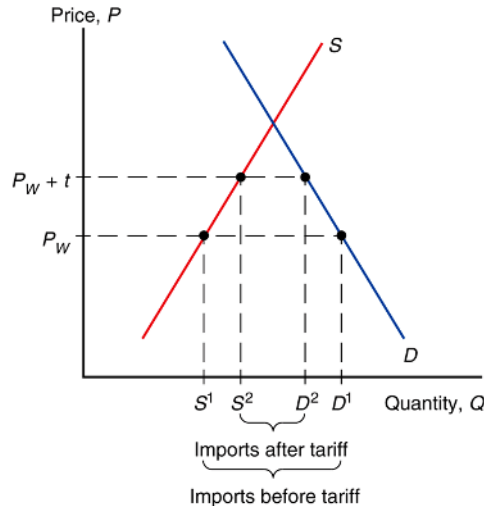
**Note:** curves will always cross as we have assumed  $P_A^* < P_A$



## Introducing Import tariffs

For a **small country**, an import tariff does not impact the world prices since its demand is not a significant part of the world demand.

- Therefore, Foreign's prices would not fall and the full impact of tariff is burdened on the Home consumers such that prices change to:
  - $P_T = P_W + t$  (where  $P_W$  is the price before tariff).
  - 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.

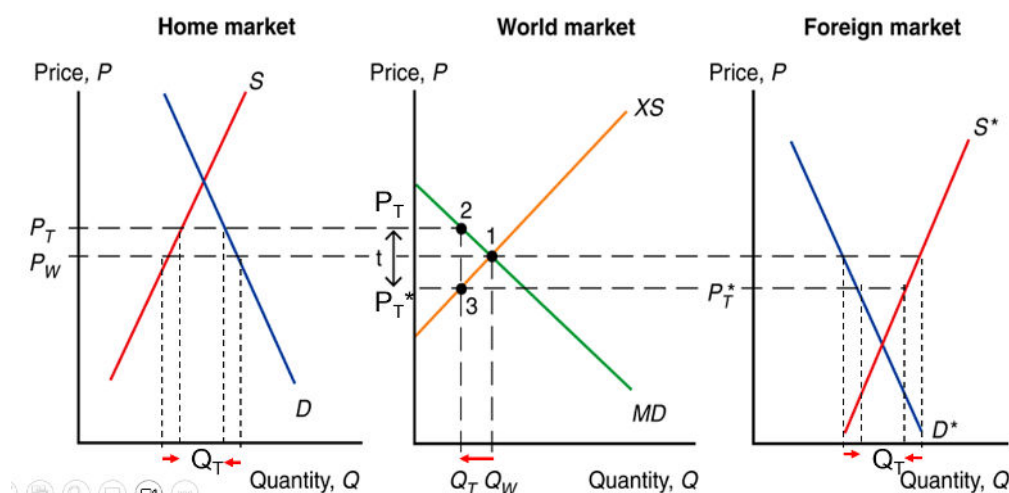
- Consumers demand less but producers supply more, causing the prices to go down in Foreign, as Home is large.
  - While prices fall in Foreign due to decreased demand
  - At Home producers faces less competition increase prices
- The trading equilibrium will therefore attest to two conditions:
  - (1) 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:

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

**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.

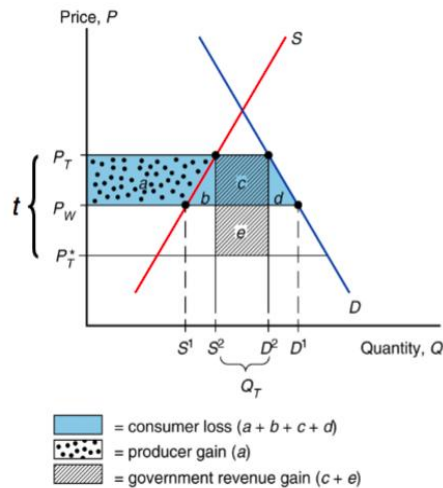
The **producer surplus** is the difference between the price received by the producers and the minimal price at which they would be willing to sell.

- 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

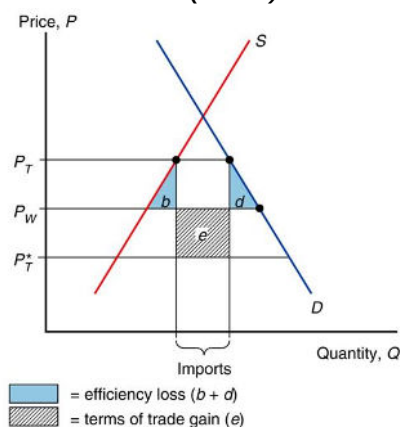
- Consumer surplus decreases (consumers worse off)
- Producer surplus increases (producers better off)
- The government collects tariff revenue equal to the tariff rate times the quantity of imports after tariff =  $t \cdot Q_T$

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



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

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



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**

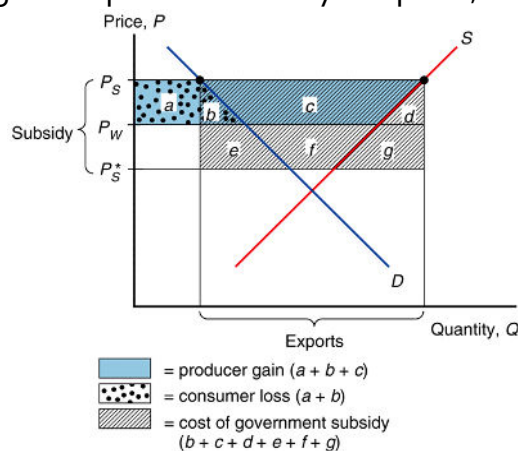
At home, the equilibrium is such that firms are indifferent between exporting and supplying domestically.

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

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:

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

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

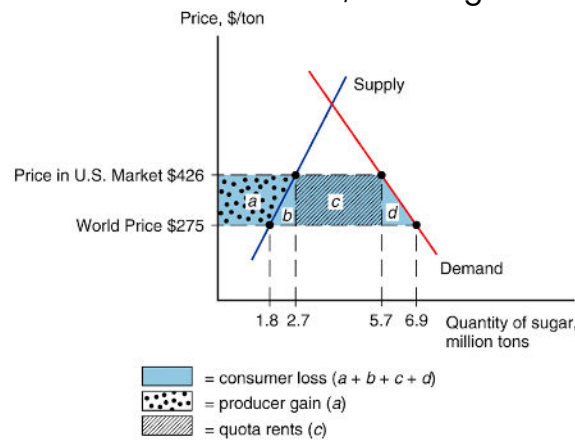
An **import quota** is a restriction on the quantity of imported goods.

- 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 =  $0.5 \cdot 60 + 0.5 \cdot 100 = \$80$  (= \$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  $P(1+t) - P^{intm}$

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

# International Trade – IBEB –

## Lecture 10, week 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**.

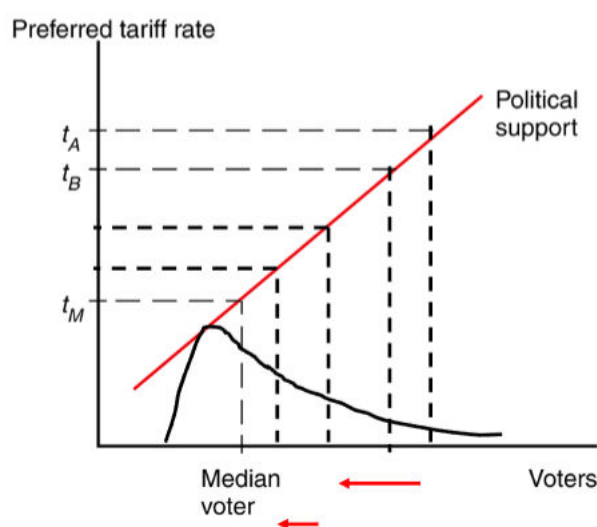
The two concepts are **median voter theorem** and **collective action**.

## 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  $t_A$  and party 2 proposes tariff  $t_B$

- All the voters that prefer  $t_A$  or higher will vote for party 1
- All the voters that prefer  $t_B$  or lower will vote for party 2
- And the voters that prefer between  $t_A$  and  $t_B$ , 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  $t_B$ , this means party 1 can then propose a new lower tariff,
- this process goes on until the proposed tariff is  $t_M$ , 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 seen 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.

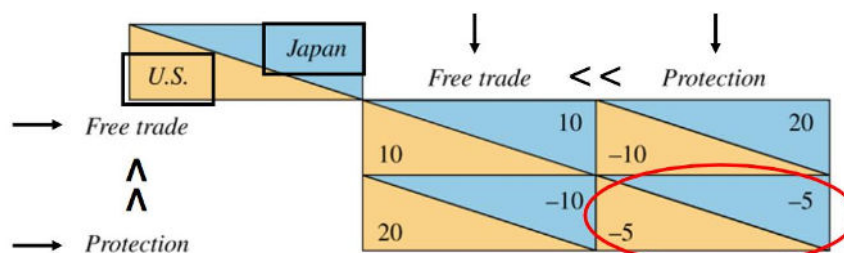
In general, trade restrictions are more prevalent when consumers do not care about trade restrictions too much, and the special groups make large enough contributions to campaigns for a deviation from median voter theorem to happen.

- 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

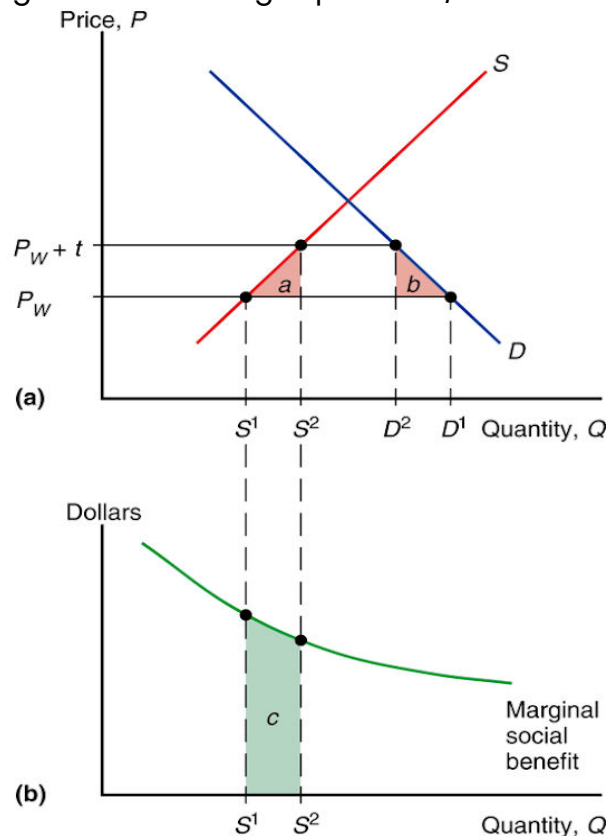
**Market failures** such as:

- 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 measures 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

- Boycotts 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.

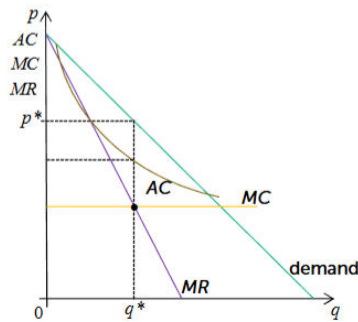
The **profit maximising** price and quantity of **a monopolist** is as follows

- 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 ( $MR = MC$ ).

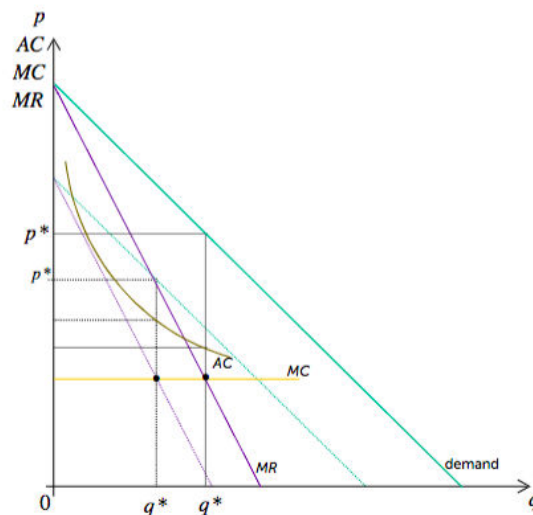
- Since average cost  $AC = F/q + c$  declines when the quantity produced increases,  $AC$  approaches marginal cost when quantity produced approaches infinity. A monopolist's profit is thus:

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



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:

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

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

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

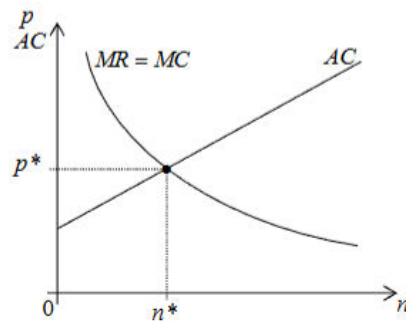
$$\text{Marginal Revenue} \rightarrow MR = \frac{1}{bn} + \underline{p} - \frac{2q}{bS} = p - \frac{q}{bS}$$

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

The profit-maximising price is therefore sensible as the wedge between  $p=mc$  decreases as  $n$  increases.

- Additionally, there is free entry in the market so firms will enter the market until market entry is no longer profitable.
- Thus, when price exceeds average cost, additional firms enter the market, and when average cost exceeds price, currently active firms exit the market.
- When price is equal to the average cost, the equilibrium number of firms operate. We thus attain:

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



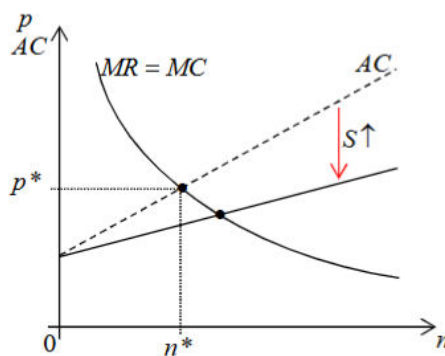
If otherwise:

- $p > AC \rightarrow$  firms enter the market
- $p < AC \rightarrow$  some exit the market, which increases  $p$  until  $p = AC$
- $p = AC \rightarrow$  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

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

### Autarkic equilibrium:

- Home:

$$n_{\text{home}}^* = \sqrt{\frac{900,000}{\frac{1}{30,000} \cdot 750,000,000}} = 6 \quad \rightarrow \quad p_{\text{home}}^* = 5,000 + \frac{1}{\frac{1}{30,000} \cdot 6} = 10,000$$

- Foreign:

$$n_{\text{foreign}}^* = \sqrt{\frac{1,600,000}{\frac{1}{30,000} \cdot 750,000,000}} = 8 \quad \rightarrow \quad p_{\text{foreign}}^* = 5,000 + \frac{1}{\frac{1}{30,000} \cdot 8} = 8,750$$

### Open economy equilibrium:

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

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.

# References

- Bosker, M. (2025). *Lecture 1 – World Trade overview* [PDF slide]. Retrieved from: [Lecture 1 – overview World Trade – without intro.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 2 – The Ricardian model* [PowerPoint slides]. Retrieved from: [Lecture 2 – comp.advantage Ricardo – PART 1.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 3 – The Ricardian model-continued* [PowerPoint slides]. Retrieved from: [Lecture 3 – comp.advantage Ricardo – PART 2.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 4 – Specific Factors model* [PowerPoint slides]. Retrieved from: [Lecture 4 – Specific Factors.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 5 – Heckscher Ohlin model* [PowerPoint slides]. Retrieved from: [Lecture 5 + 6 – Heckscher Ohlin.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 6 – Heckscher Ohlin model – continued* [PowerPoint slides]. Retrieved from: [Lecture 5 + 6 – Heckscher Ohlin.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 7 – The Standard trade model* [PowerPoint slides]. Retrieved from: [Lecture 7 – Standard Trade Model.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 8 – External economies of scale* [PowerPoint slides]. Retrieved from: [Lecture 8 – External Economies of Scale.pdf: International Economics](#)
- Bosker, M. (2025). *Lecture 9 – Instruments of the Trade policy* [PowerPoint slides]. Retrieved from: [Lecture 9 – Instruments of Trade Policy.ppt: International Economics](#)
- Bosker, M. (2025). *Lecture 10 – Trade Policy in practice* [PowerPoint slides]. Retrieved from: [Lecture 10 – Trade Policy in Practice.ppt: International Economics](#)
- Emani Namini, J. (2025). *Lecture 11 – Firms in the global economy* [PowerPoint slides]. Retrieved from: [Lectures 11+12 – Firms in the global economy.pdf: International Economics](#)