

# International Economics

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## Lecture 2

## **A brief historical review of trade theory**

- Mercantilism
- David Hume and the price-specie-flow mechanism
- Adam Smith - absolute advantage in production
- David Ricardo - comparative advantage and the gains from trade

# Mercantilism

- The wealth of a country depends on gold and silver that it accumulated.
- The most important way of accumulating wealth is export - **a nation should strive for a positive balance of trade** (or net export).
- Imports (mainly trade deficit) lead to loss of wealth. All imports of foreign goods should be discouraged as much as possible.

# Mercantilism

- Imports should be confined to raw materials that can be finished in the country. No importation should be allowed if goods are sufficiently and suitably supplied at home.
- Indispensable goods should be obtained in exchange for other domestic goods instead of gold and silver.
- The government has a role to promote exports and restrict imports.

# Mercantilism

- Sum of trade balances in the world is equal 0.
- Foreign trade creates losers and gainers. One country's economic gain is at expense of another.
- Foreign trade can be regarded as a zero-sum game.

# The price-specie-flow mechanism

- A commercial imbalance between countries increases or reduces their respective stock of gold and triggers a series of adjustments which tend to re-establish a monetary equilibrium.
- Trade surplus (a positive balance of trade) means an accumulation of foreign reserve (gold flows into the country in the amount that the value of exports exceeds the value of imports).
- Conversely, when a country has a negative balance of trade, gold flows out of the country in the amount that the value of imports exceeds the value of exports.

- The arrival of new gold in a country increases the money supply in this country and enhances the ability of its inhabitants to buy commodities.
- This rising demand increases prices, notably in relation to prices in other countries, and thus reduces the competitiveness of this country's exports.
- At the same time, the growing demand tends to increase the amount of goods that are imported.
- Hence, this country would see its commercial balance decline, leading gold to flow back out until a monetary equilibrium is re-established.

# The simple classical framework - assumptions

## **Theory of absolute advantage**

- A homogenous factor called labour
- Two sectors of homogenous commodities
- Two countries, each of which has a fixed endowment of labour
- Free trade and zero transport costs

## The simple classical framework - assumptions

- Constant **labour coefficient** of the commodities for each sector in each country – constant amount of labour required to produce each unit of a commodity (marginal product of labour is constant)
- Labour perfectly mobile between sectors within a country but perfectly immobile internationally (the wage rate is the same in both sectors)
- Sectors characterized by perfect competition (flexible prices, firms take the wage rate and output prices as given)

A closed economy (under autarky - self-sufficient economy)

### Labour needed

	Cloth	Wine
Country A	<b>10 hrs/metre</b>	8 hrs/litre
Country B	15 hrs/metre	<b>6 hrs/litre</b>

- These numbers are called labour coefficients of the commodities.
- Since the labour coefficient of each commodity is constant, the cost of producing one unit of the commodity (in terms of the wage rate  $w$ ) must be constant.

- Country A

$$10 \cdot C + 8 \cdot W = \textit{total labour}$$

- Country B

$$15 \cdot C + 6 \cdot W = \textit{total labour}$$

- Country A  $10 \cdot C + 8 \cdot W = 250$

$$C = -0.8 \cdot W + 25$$

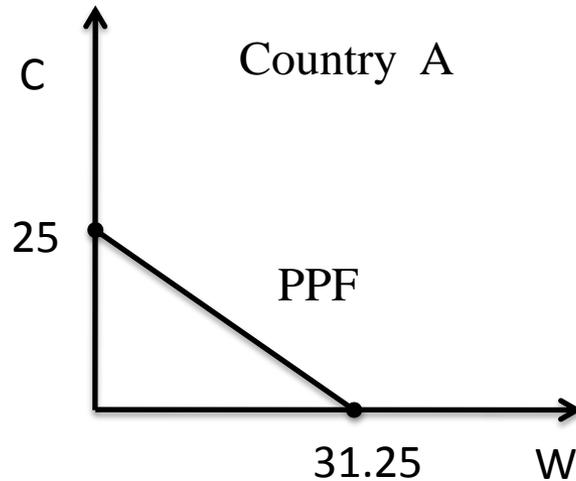
- Country B  $15 \cdot C + 6 \cdot W = 300$

$$C = -\frac{6}{15} \cdot W + 20 = -0.4 \cdot W + 20$$

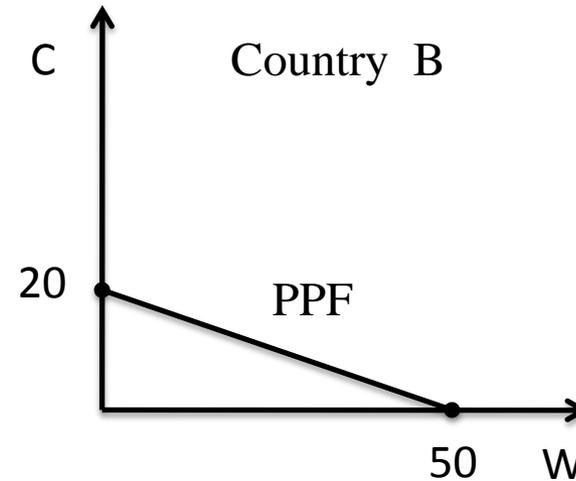
- The production possibilities can be illustrated by the **production possibility frontier (PPF)**
- **Definition of PPF:** All combination of the two goods which an economy can produce at a point in time, given its resources, production technology
- PPF (in example) can be defined as the locus of the maximum output of cloth when given any output of wine (the later not greater than is maximum output).

The equation of PPF in country A is the following:  $C = -0.8W + 25$

The equation of PPF in country B is the following:  $C = -0.4W + 20$



Price under autarky: 0.8



Price under autarky: 0.4

The slope is numerically equal to the marginal rate of transformation  
= the autarkic price ratio

The autarkic **consumption possibility frontier (CPF)** of economy is the same as its PPF because it cannot consume more than it has produced

Output produced (assumed) - autarky equilibrium

	Cloth (metres)	Wine (litres)
Country A	13	15
Country B	10	25

World's output of cloth: 23

World's output of wine: 40

$$10 \cdot 13 + 8 \cdot 15 = 250$$

$$15 \cdot 10 + 6 \cdot 25 = 300$$

- A nation (country) has **absolute advantage** in the production of a good if, compared to another country, it uses less resources to produce it.
- Based on the labour coefficients in two countries, *A* has an absolute advantage in production of cloth (or an absolute disadvantage in wine) and *B* has an absolute advantage in the production of wine (or an absolute disadvantage in cloth).

- **Theory of absolute advantage:** Under free trade, each country completely specializes in the production of the good in which it has an absolute advantage, and exports the good.
- Both countries gain.

## After specialization and trade

	Cloth (metres)	Wine (litres)
Country A	25	0
Country B	0	50

Total world's output of cloth: 25      Total world's output of wine: 50

Gains from trade:  $25 - 23 = 2$  units of cloth,  
 $50 - 40 = 10$  units of wine

The world price ratio is called the world's terms of trade.

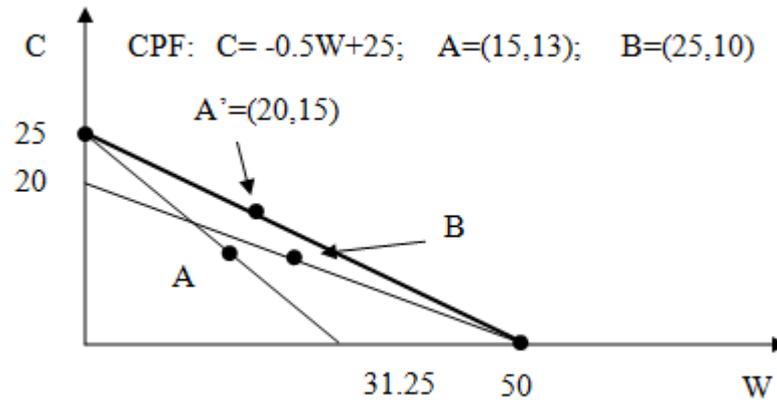
Terms of trade (TT): 0.4 - 0.8      Let  $TT=0.5$

The equation of CPF in country A is the following  $C=-0.5W+25$

	Country A	Country B
Production	(0W, 25C)	(50W, 0C)
Consumption	(20W, 15C)	(30W, 10C)
Exports	10C	20W
Imports	20W	10C
Consumption in autarky	(15W,13C)	(25W,10C)

- Before trade, the labour value of country A's consumption (= the labour value of its production) = 250 units
- After trade, the labour value of consumption is  $20*8+15*10=310$  labour hours.
- The labour value of country B's consumption before trade is 300 labour hours.
- After trade it is  $30*6+10*15=330$  labour hours.

# A graphical analysis



Trade expands each country's consumption possibilities.

After trade the consumption possibility frontier (CPF) of each country is represented by a line passing through its production point with a slope equal to the negative of the world price ratio (TT).

## Conclusions

- Both countries gain from trade.
- Trade is regarded as a positive sum game. Trade can make at least one country (possibly both) better off without hurting the other country.
- Questions: Is trade possible between two countries when one of countries has absolute advantage in both goods? Do both countries gain from trade?
- Smith's theory does not predict whether trade between the countries will exist and if it exists, whether it will benefit both countries.

A closed economy.

Country A has absolute advantage in both goods,  
country B has absolute disadvantage in both goods

	Cloth	Wine
Country A	<b>10 hrs/metre</b>	<b>8 hrs/litre</b>
Country B	40 hrs/metre	10 hrs/litre

Total labour: country A - 240 units, country B - 240 units

- Country A  $10 \cdot C + 8 \cdot W = 240$

$$C = -0.8 \cdot W + 24$$

- Country B  $40 \cdot C + 10 \cdot W = 240$

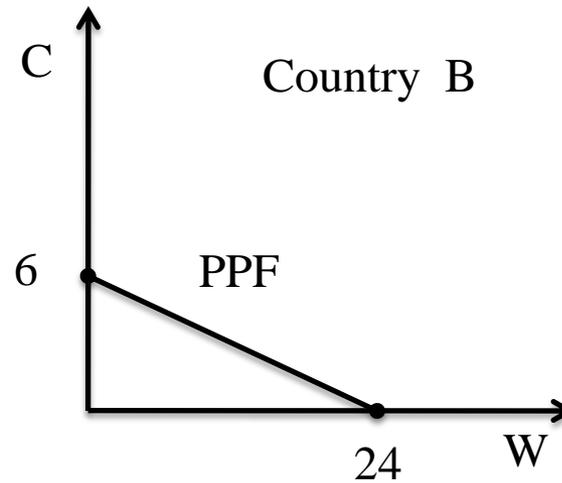
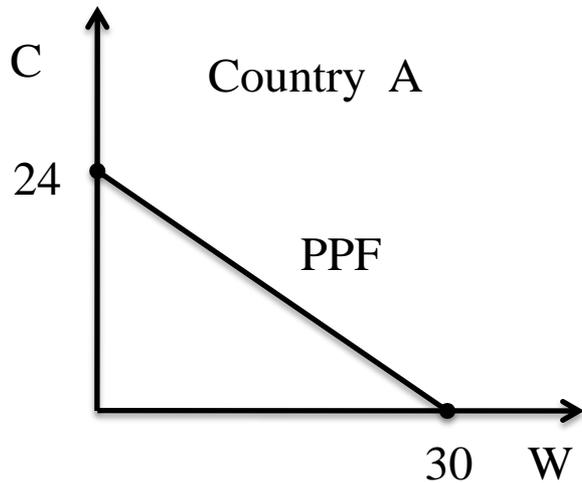
$$C = -\frac{10}{40} \cdot W + 6 = -0.25 \cdot W + 6$$

To show the production possibilities of the economy let assume:

Total labour: country A - 240 units, country B - 240 units

The equation of PPF in country A is the following:  $C = -0.8W + 24$

The equation of PPF in country B is the following:  $C = -0.25W + 6$



Key concept: **the opportunity cost** of one good production is how many units of second good the economy would have to give up in order to produce an additional unit of first good

- Opportunity cost of wine production (how many units of cloth the economy would have to give up in order to produce an additional unit of wine):
- Country A : 1 unit of wine  $\rightarrow$  8 labour hours  $\rightarrow$  0.8 unit of cloth (opportunity cost of wine)
- Country B : 1 unit of wine  $\rightarrow$  10 labour hours  $\rightarrow$  0.25 unit of cloth
- Country A is more efficient at producing both goods (has absolute advantage in producing both goods). However, opportunity cost of producing wine is higher in country A than in B.
- Country B has a **comparative advantage** in **wine** production (i.e. lower opportunity cost).
- Country A has a **comparative advantage** in **cloth** production.

- Ricardo argued that each country can gain by exporting the good in which it has a comparative advantage.
- Country A gains from specialising in cloth production and importing wine from country B.
- Country B gains from specialising in wine production and importing cloth from country A.

# Output produced (assumed) - autarky equilibrium

The equation of PPF in country A:  $C = -0.8W + 24$

The equation of PPF in country B:  $C = -0.25W + 6$

	Cloth (metres)	Wine (litres)
Country A	12	15
Country B	4.2	7.2

- $(-0.8 * 15 + 24 = 12; -0.25 * 7.2 = 4.2)$
- Ricardo assumed that world's price ratio is between the autarkic price ratios in the countries. For example  $TT = 0.5$
- The equation of CPF in country A is the following:  
 $C = -0.5W + 24$                        $(0, 24)$
- The equation of CPF in country B has the form:  
 $C = -0.5W + 12$                        $(24, 0)$

## After specialization and trade

	Country A	Country B
Production	(0W, 24C )	(24W, 0C)
Consumption	(16W, 16C)	(8W, 8C)
Exports	8C	16W
Imports	16W	8C
Consumption in autarky	(15W, 12C)	(7.2W, 4.2C)

$$C = -0.5W + 24 \quad -0.5 * 16 + 24 = 16$$

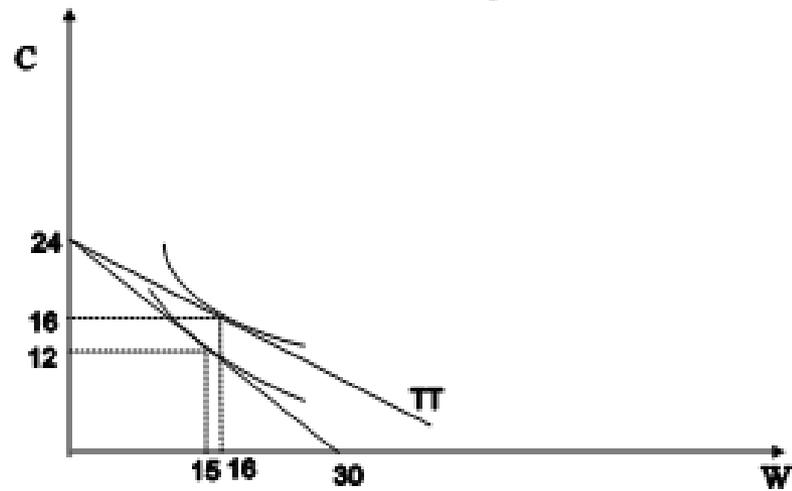
$$C = -0.5W + 12 \quad -0.5 * 8 + 12 = 8$$

## Conclusions

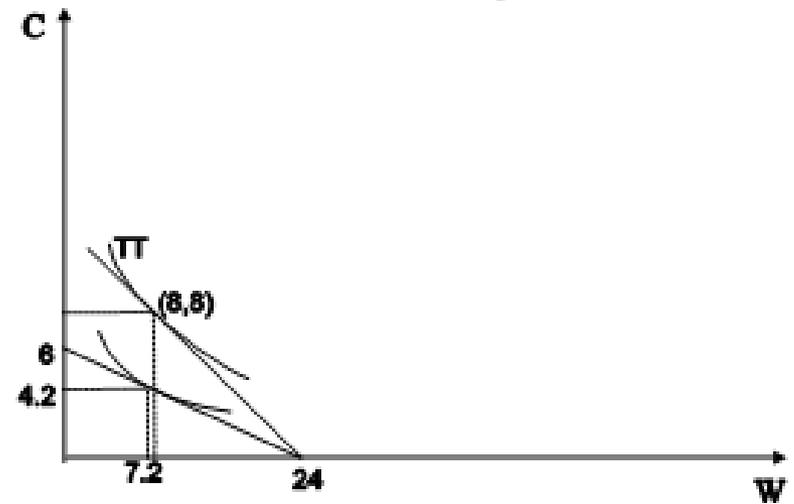
- Before trade, the labour value of country **A**'s consumption (= the labour value of its production) = 240 labour hours.
- After trade the labour value of consumption is  $16*10+16*8=288$  labour hours.
- The labour value of country **B**'s consumption before trade is 240 labour hours.
- After trade it is  $8*40+8*10=400$  labour hours.

# A graphical analysis

## Country A



## Country B



## Conclusions

- Basis for international trade and source of gains from trade – differences in labour productivity (differences in technology).
- Each country specializes in the production of the good in which it has a comparative advantage.
- Each country exports the good in which it has a comparative advantage. A country exports the good which it can produce relatively efficiently.
- Trade based on comparative advantage **can** make everyone better off after trade.

## Conclusions

- Even if one country is technologically superior to the other in both industries, one of these industries would go out of business when opening to free trade.
- Technological superiority is not enough to guarantee continued production of a good in free trade. A country must have a comparative advantage in production of a good rather than an absolute advantage to guarantee continued production in free trade.
- **The developed country's superior technology need not imply that less-developed country industries cannot compete in international market.**

## Conclusions

- The technologically superior country's comparative advantage industry survives while the same industry disappears in the other country, even though the workers in the other country's industry have lower wages.
- Low wages in another country in a particular industry is not sufficient information to determine which country's industry would perish under free trade.
- **Trade may not result in a domestic industry's decline just because the foreign firms pay their workers lower wages.**

## Conclusions

- The movement to free trade generates an improvement in welfare in both countries individually and nationally.
- Specialisation and trade will increase the set of consumption possibilities, compared with autarky, and will make possible an increase in consumption of both goods nationally.

## Conclusions

- Free trade raises aggregate world production efficiency because more goods are likely to be produced with the same number of workers.
- Free trade also improves aggregate consumption efficiency, which implies that consumers have a more pleasing set of choices and prices available to them.

## **Weaknesses of the Ricardian Theory**

Highly stylized model of technological differences:

- single factor of production (labour),
- constant productivities in generating commodity outputs,
- constant opportunity costs,
- likelihood of complete specialization in trade,
- the existence of positive income gains from trade for all workers in both countries (unless one country is much larger than the other and does not specialize completely).

In practice it is not true that all workers are made better off by engaging in international trade.

# The Heckscher-Ohlin Theory

- Factor Abundance, Factor Intensities
- The Heckscher-Ohlin (H-O) Theorem
- The Factor-Price Equalization Theorem
- The Stolper-Samuelson Theorem
- The Rybczynski Theorem
- Testing the H-O Model    Leontief Paradox

# Questions

1. What if the technology available was the same for all countries. Would there be any reason to trade? Is there any basis for comparative advantage?
2. Where does comparative advantage come from and why does it change?
  - Why does Japan have a comparative advantage in high technology industries?
  - What has enabled Japan to shift its comparative advantage from textiles (in the years after WWII) to high technology manufacturing products?

**The H-O Theorem** - aims to answer the questions 1-2

## Questions

3. How does international trade affect the differences in relative factor prices between nations? How do factor prices vary across countries?

For example: How does trade affect the gap between relative labour wages in Poland and relative labour wages in Germany?

4. How does trade affect the distribution of income among factors of production within nations? Does trade increase labour's share of the income or does it shift the distribution towards the owners of capital?

**The Factor-Price Equalization Theorem** - answers the question 3

**The Stolper-Samuelson Theorem** - answers the question 4

- **Eli F. Heckscher** (1919), *The Effect of Foreign Trade on the Distribution of Income* [in Swedish], *Ekonomisk Tidskrift*, 21(2), pp 1-32.; reprinted in *Readings in the theory of international trade*, Homewood, IL: Irwin, 1950, pp 272-300.
- **Bertil G. Ohlin** (1933), *Interregional and International Trade*, Cambridge, MA: Harvard University Press.

## The Heckscher-Ohlin model - assumptions

- Two countries, two homogenous tradeable consumption goods and two homogenous nontradeable factors of production (capital  $K$ , labour  $L$ ).
- Factor endowments fixed in each country but different across countries (countries differ in their relative factor endowments), perfect factor mobility within a country but not between countries.
- Identical, linearly homogenous technologies across countries (constant returns to scale, with diminishing marginal returns to inputs).

## **The Heckscher-Ohlin model - assumptions**

- The production functions differ in relative usage of capital and labour – one good is capital intensive, another good is labour intensive (differences in factor intensity across sectors).
- Identical and homothetic (homogenous) preferences in both countries (the assumption eliminates the possibility that comparative advantage can be based on differences in demand behaviour).
- Perfect competition (perfect price flexibility, fully employed factors).
- Free trade and insignificant transport costs.

The H-O model departs from Ricardian model  
in two fundamental ways

- It assumes existence of second factor (capital).
- The model rests on the notion of identical production functions in both countries.

Countries are identical in every respect except one: they have different endowments of factors, i.e. of labour and capital.

Trade is based on differences in supplies of capital and labour not on international technological differences.

# Factor Abundance

What does factor abundance mean?

Factor abundance is measured relatively: by the ratio between the amount of capital and amount of labour or by the ratio between factor prices.

Definitions: Country A versus country B is capital abundant if

- *physical definition*:  $\left(\frac{K}{L}\right)_A > \left(\frac{K}{L}\right)_B$  (the capital-labour ratio in A greater than it is in B – country A is relatively capital-abundant or labour-scarce),
- *price definition*: under autarky  $\left(\frac{w}{r}\right)_A > \left(\frac{w}{r}\right)_B$ .

$K$  - total amount of capital,  $L$  - total amount of labour,  $w$ - wage rate,  $r$  - rental rate of capital

## Example (Factor abundance)

Consider two factors: labour and land

assumption: labour force = population; land = area of a country

Country	Area (sq km)	Polulation	Population density
Belgium	30,528	11,007,020	360.6
China	9,640,821	1,339,724,852	138.96
Germany	357,021	81,799,600	229.1
Poland	312,685	38,186,860	122.1
Portugal	92,090	10,647,763	115.6
Russia	17,075,400	142,905,208	8.37
Spain	504,030	46,030,109	91.3
Turkey	783,562	73,722,988	94.1
USA	9,826,675	312,355,000	31.8

- Belgium is the most labour-abundant country in the group.
- China versus Belgium and Germany is relatively scarce in labour.
- Poland versus Portugal is relatively scarce in land (or relatively labour-abundant).
- Poland versus Belgium is relatively scarce in labour.

# Factor Intensities

Let a country produces good  $X$  and good  $Y$ .

Total amount of capital is divided into two sectors:

$$K = K_X + K_Y,$$

where

$K_X$  - an amount of capital used for production of good  $X$ ,

$K_Y$  - an amount of capital used for production of good  $Y$ .

Total amount of labour is  $L = L_X + L_Y$ .

# Factor Intensities

Good  $X$  is relatively capital-intensive and good  $Y$  is relatively labour-intensive if:

1. The capital-labour ratio used in production of good  $X$  is higher than the capital-labour ratio used in production of good  $Y$ :

$$\frac{K_X}{L_X} > \frac{K_Y}{L_Y} \quad \text{or} \quad \frac{a_{KX}}{a_{LX}} > \frac{a_{KY}}{a_{LY}}$$

where

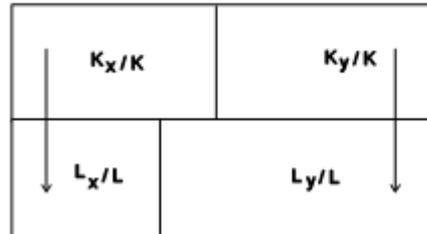
$$a_{KX} = \frac{K_X}{X}, \quad a_{LX} = \frac{L_X}{X}, \quad a_{KY} = \frac{K_Y}{Y}, \quad a_{LY} = \frac{L_Y}{Y}.$$

# Factor Intensities

2. The percentage of total capital that is used in production of good  $X$  is bigger than the percentage of total labour that is used for production of good  $X$

$$\frac{K_X}{K} > \frac{L_X}{L} \quad \text{or} \quad \text{relatively} \quad \frac{L_Y}{L} > \frac{K_Y}{K}$$

Graphical illustration



Total capital  $K \rightarrow 100\%$

Total labour  $L \rightarrow 100\%$

## Factor Intensities

3. The share of the cost of capital in the price of good  $X$  ( $a_{KX} \cdot r/p_X$ ) is bigger than the share of the cost of capital in the price of good  $Y$  ( $a_{KY} \cdot r/p_Y$ ).

$$\frac{a_{KX} \cdot r/p_X}{a_{LX} \cdot w/p_X} > \frac{a_{KY} \cdot r/p_Y}{a_{LY} \cdot w/p_Y}$$

where  $r$  is the rental rate,  $w$  is the wage rate,  $p_X$  is the price of good  $X$ ,  $p_Y$  is the price of good  $Y$ .

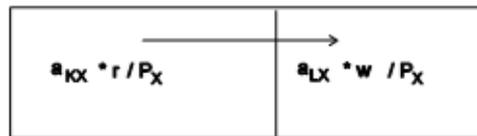
# Factor Intensities

price of good = rental rate  $\times$  number of units of capital  
+ wage rate  $\times$  number of units of labour

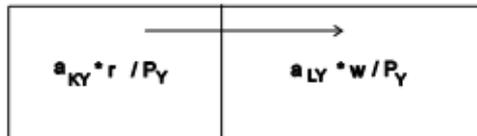
The price of good  $X$ :  $p_X = a_{KX} \cdot r + a_{LX} \cdot w$ ,

The price of good  $Y$ :  $p_Y = a_{KY} \cdot r + a_{LY} \cdot w$ .

Graphical illustration



Price of  $X \rightarrow 100\%$



Price of  $Y \rightarrow 100\%$

## Example (Factor intensity)

Let's consider a country with fixed total amount of capital and labour that produces good  $X$  and  $Y$ .

Assumption: Total capital = 1500 units; Total labour = 900 units

	Good $X$	Good $Y$
Capital ( $K$ )	1000	500
Labour ( $L$ )	500	400
Capital-Labour ratio	<b>1000/500=2</b>	<b>1.25</b>
Factor intensity	Capital-intensive	Labour-intensive
Capital/Total capital	<b>1000/1500=0.67</b> ↑	0.33 ↑
Labour/Total labour	500/900=0.56 ↓	<b>0.44</b> ↓
Factor intensity	Capital-intensive	Labour-intensive

	Good X	Good Y
Total amount of a good	100	200
Price of a good	28	10
Rental rate of capital ( $r$ )	0.8	0.8
Wage rate ( $w$ )	4	4
Share of the cost of capital in the price of good	<b>0.29</b>	0.2
Share of the cost of labour in the price of good	0.71	<b>0.8</b>
Factor intensity	Capital-intensive	Labour-intensive

$$a_{KX} = \frac{1000}{100} = 10, \quad a_{LX} = \frac{500}{100} = 5,$$

$$a_{KY} = \frac{500}{200} = 2.5, \quad a_{LY} = \frac{400}{200} = 2$$

To obtain  $r$  and  $w$  one's must solve the following system of linear equations:

$$\begin{cases} p_X = a_{KX} \cdot r + a_{LX} \cdot w \\ p_Y = a_{KY} \cdot r + a_{LY} \cdot w \end{cases} \rightarrow \begin{cases} 28 = 10 \cdot r + 5 \cdot w \\ 10 = 2.5 \cdot r + 2 \cdot w \end{cases} \rightarrow \begin{cases} r = 0.8 \\ w = 4 \end{cases}$$

$$\frac{a_{KX} \cdot r / p_X}{a_{LX} \cdot w / p_X} = \frac{0.29}{0.71} = 0.41 > \frac{a_{KY} \cdot r / p_Y}{a_{LY} \cdot w / p_Y} = \frac{0.2}{0.8} = 0.25$$

## The Heckscher-Ohlin Model

- Comparative advantage is determined by the interaction of factor-abundances of nations and factor-intensities of products.
- H-O model suggests that each nation has a comparative advantage in the good that intensively uses the abundant factor.

## The Heckscher-Ohlin Model

- **The Heckscher-Ohlin Theorem:** Under the H-O assumptions, each country will export the good that uses relatively intensively its relatively abundant factor of production.
- The countries that have abundant supplies of agricultural land tend to be exporters of grains and food.
- Countries with abundant endowments of low-skilled labour tend to export labour-intensive goods (clothing, footwear, consumer electronics).

## As a result of trade in each country

- The production of the good in which a country has a comparative advantage will increase.
- The production of the good that uses the country's abundant resource will increase, while the production of the good that uses the country's scarce resource will decrease.
- As the production of the good using the abundant resource intensively increases, demand for that resource will increase, so the demand for the scarce resource, but by a smaller amount.
- As the production of the good that uses the scarce resource intensively decreases, both abundant and scarce resources will be released, but relatively more of the scarce resource will be released than the abundant resource.

Comparative advantage can change for a nation if either

- its relative factor abundance changes compared to other nations

or if

- technological change creates a change in the factor intensity properties of particular products.

## The Factor-Price Equalization Theorem (FPE)

- Under the H-O assumptions, free trade in goods tends to equalize relative factor prices across national borders, so long as economies produce both goods.

Relative price of capital - the price of capital relative to the price of other factor in a country.

# The Factor-Price Equalization Theorem (FPE)

- Free trade tends to rise the relative price of capital in a capital abundant country, because capital is intensively used in the expanding capital intensive export industries. The increasing demand for capital, raising its relative price.
- At the same time, the relative price of capital tends to fall in a labour abundant country. The autarky price of capital in a labour abundant country is high because it is a capital scarce country. As trade begins, this country begins to rely less on its own production of capital-intensive goods and instead imports cheaper capital intensive good. Capital intensive sector contracts, the relative price of capital falls.
- In theory this pattern continues until the relative price of capital in both countries reach equality at some level between the two autarky equilibria.

## Factor-Price Equalization

- is a tendency, not an outcome, because of market imperfections (trade restrictions, positive transport costs, not identical technologies, imperfect competition);
- talks only about relative prices and wages, not absolute prices and wages (the relative are equal even though the absolute prices are different);
- says that relative factor prices will tend towards equality between nations, not within nations (trade will not cause the wage of scarce semi-skilled labour to rise to level of the capital in a capital abundant country).

**Full factor price equalization is never observed.**

## **The Stolper-Samuelson Theorem (S-S)**

Given diversification in production, a change in the price of a traded good results in a more than proportional change, in the same direction, in the price of the factor that is used in the production of that good more intensively.

## Example (Stolper-Samuelson Theorem)

Consider a country of Example 2

	Price of X	Price of Y	Rental rate of capital	Wage rate
Level	28	10	0.8	4
Percentage change	10%	0%	93.3%	-23.3%
	10%	10%	10%	10%
	0%	10%	-83.3%	33%
	10%	5%	52%	-7%

A 10% increase in price of  $X$  gets 93.3% increase in rental rate and 23.3% reduction in wage.

price of good = rental rate  $\times$  number of units of capital  
 + wage rate  $\times$  number of units of labour

The price of good  $X$ :  $p_X = a_{KX} \cdot r + a_{LX} \cdot w$ ,

The price of good  $Y$ :  $p_Y = a_{KY} \cdot r + a_{LY} \cdot w$ .

Assumption: Total amount of  $X = 100$  units;  
 Total amount of  $Y = 200$  units;

$$a_{KX} = \frac{1000}{100} = 10, \quad a_{LX} = \frac{500}{100} = 5,$$

$$a_{KY} = \frac{500}{200} = 2.5, \quad a_{LY} = \frac{400}{200} = 2$$

$$a_{KX} = \frac{K_X}{X}, \quad a_{LX} = \frac{L_X}{X}, \quad a_{KY} = \frac{K_Y}{Y}, \quad a_{LY} = \frac{L_Y}{Y}.$$

The Stolper-Samuelson theorem explains how international trade may affect the distribution of income among different factors within nations.

- The changes in output prices resulting from trade will lead to (more than proportional) changes in the relative input prices.
- The price of the abundant factor will increase proportionally more than the increase in the price of the good that uses the abundant factor intensively: that results in the increase in the real wages in a labour abundant country.

- The price of the scarce resources will decrease proportionally more than the decline in the price of the good that uses the scarce resource intensively: the rental price of capital in the capital poor country will decrease.
- Increased trade between a skilled labour abundant economy and unskilled labour abundant economy will increase the relative wage of skilled workers in the skilled labour abundant economy.

- Trade benefits the abundant factor of production. Abundant factors have a larger share of the rising real income of nation.
- Scarce factors may gain, lose, or experience no change in real income depending upon whether their falling share of national income is offset by the increase in real income.

## Example

Consider a capital abundant country with its national income 1000 units of currency, capital share of national income is 60% (600), labour share is 40% (400). After trade national income rises by 10% (level 1100).

Owners of labour:

- are worse off, when labour experiences a 5% fall (level:  $0.35 * 1100 = 385$ ),
- experience no change, when labour decreases by 3.63% ( $400 / 1100 = 0.3636$ ;  $0.4 - 0.3636 = 0.03636$ ) (level: 400),
- are better off, when labour experiences a 2% fall (level: 418).

	Country A	Country B
Abundant factor	Capital	Labour
Comparative advantage (H-O)	Capital-intensive product	Labour-intensive product
Affect of specialization and trade on factor prices (FPE)	Increase in price of capital relative to wage	Increase in wage relative to price of capital
Winners (S-S)	Owners of capital	Labour force

## **The Rybczynski Theorem - 1955**

Holding relative goods prices constant and if both commodities continue to be produced, an increase in the endowment of one factor of production will lead to an increase in the output of the good using that factor intensively and a decrease in the output of the other good.

Suppose that the economy's capital endowment is increased while commodity (and thus factor as well) prices are fixed.

- In order to absorb the increase in capital endowment, the capital-intensive sector must expand.
- When the capital-intensive sector expands, it attracts labour from the labour-intensive sector, leading to a drop in the latter's production.

Suppose that the economy's capital endowment is increased while commodity (and thus factor as well) prices are fixed.

- Because the labour-intensive sector releases not only labour but also capital, the increase in capital in the capital-intensive sector must be more than the increase in capital endowment.
- This implies that percentage increase in capital-intensive output is greater than that in the capital endowment.

## Example (Rybczynski Theorem)

Consider a country of Example 2

	Total Capital	Total Labour	Good X	Good Y
Level	1500	900	100	200
Percentage change	10%	0%	40%	-50%
	10%	10%	10%	10%
	0%	10%	-30%	60%
	10%	5%	25%	-20%

A 10% increase in capital gets 40% increase in production of capita-intensive output (good X) and 50% reduction in production of labour-intensive output (good Y)

Holding  $a_{KX}$ ,  $a_{LX}$ ,  $a_{KY}$ ,  $a_{LY}$  constant, to obtain  $X$  and  $Y$  one's must solve the following system of linear equations:

$$\begin{cases} K = a_{KX} \cdot X + a_{KY} \cdot Y \\ L = a_{LX} \cdot X + a_{LY} \cdot Y \end{cases} \rightarrow \begin{cases} 1500 = 10 \cdot X + 2.5 \cdot Y \\ 900 = 5 \cdot X + 2 \cdot Y \end{cases} \rightarrow \begin{cases} X = 100 \\ Y = 200 \end{cases}$$

## Conclusions

- Interaction between differences in factor abundance across countries and differences in factor intensity across industry is the key to understanding the determinants and effects of international trade.
- A country will export the commodity that uses well-endowed factor more intensively.
- Exports as a group should be more intensive in use of the abundant factor than imports as a group.

## Conclusions

- The Stolper-Samuelson theorem, which relates changes in commodity prices to changes in real factor prices, provides a fundamental prediction about the effects of trade on the distribution of real incomes between capital and labour.
- Because free trade causes exports and imports to rise, it follows that relatively abundant factor gains real income in each country and the scarce factor loses real income.
- Both countries gain from trade, but free trade causes a redistribution of real income between capital and labour in comparison with autarky.