

EE451

Chapter 2: Explanations for Trade

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Mathematical and Graphical Illustrations of Comparative Advantage for a One-Factor Economy

- The **unit labour requirement** is the number of hours of labour required to produce one unit of output.
 - a_{LW} = the unit labour requirement for wine
 - e.g. if $a_{LW} = 2$, then one needs 2 hours of labour to produce one gallon of wine.
 - a_{LC} = the unit labour requirement for cheese
 - e.g. if $a_{LC} = 1$, then one needs 1 hour of labour to produce a pound of cheese.
- The economy's total resources are defined as L which is also the so-called total labour supply or country's endowment
 - e.g. if $L = 120$, then this economy is endowed with 120 hours of labour or 120 workers.

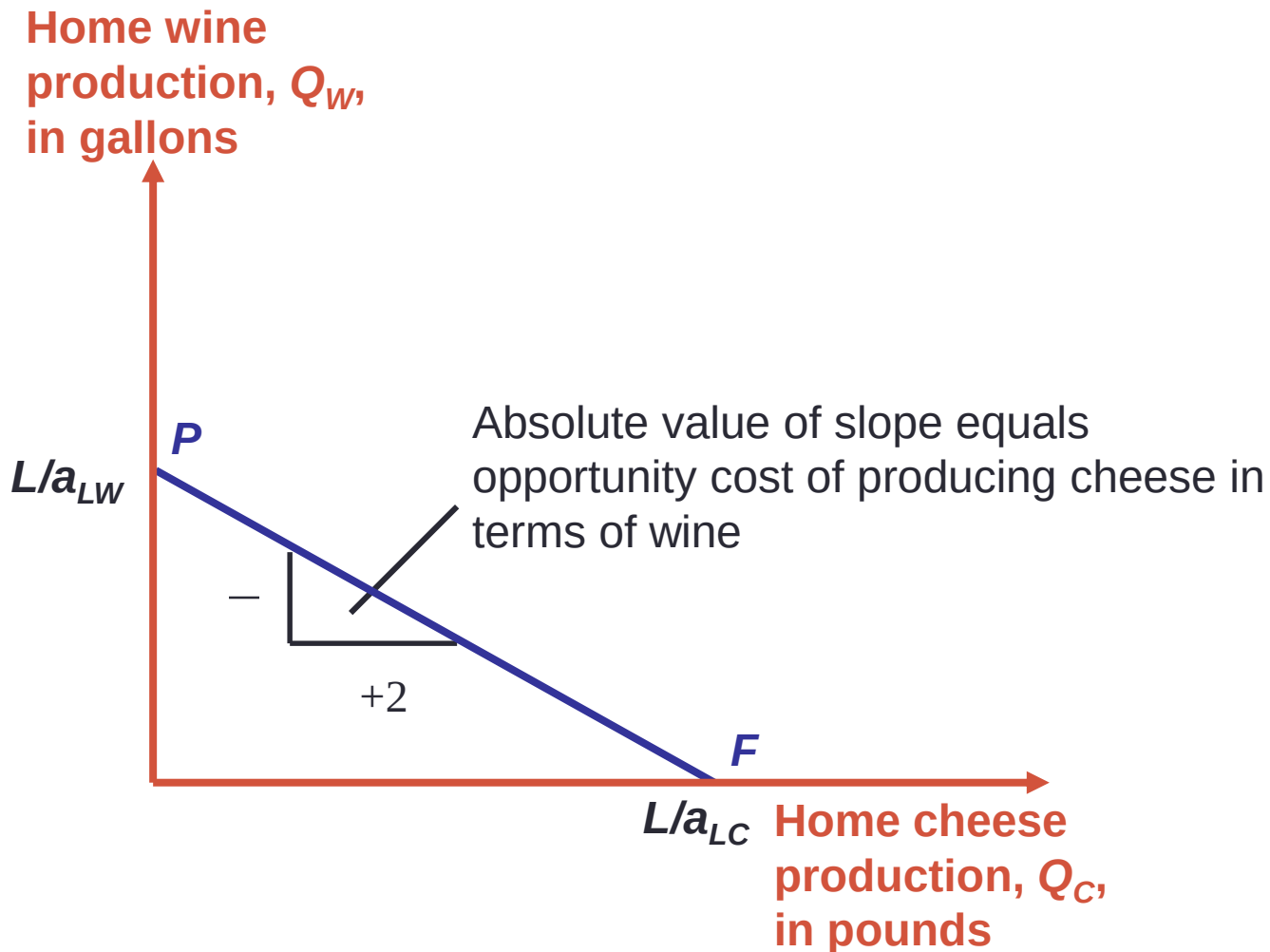
Production Possibilities

- The PPC (or PPF) of 'Home' economy is therefore given by the following equation:

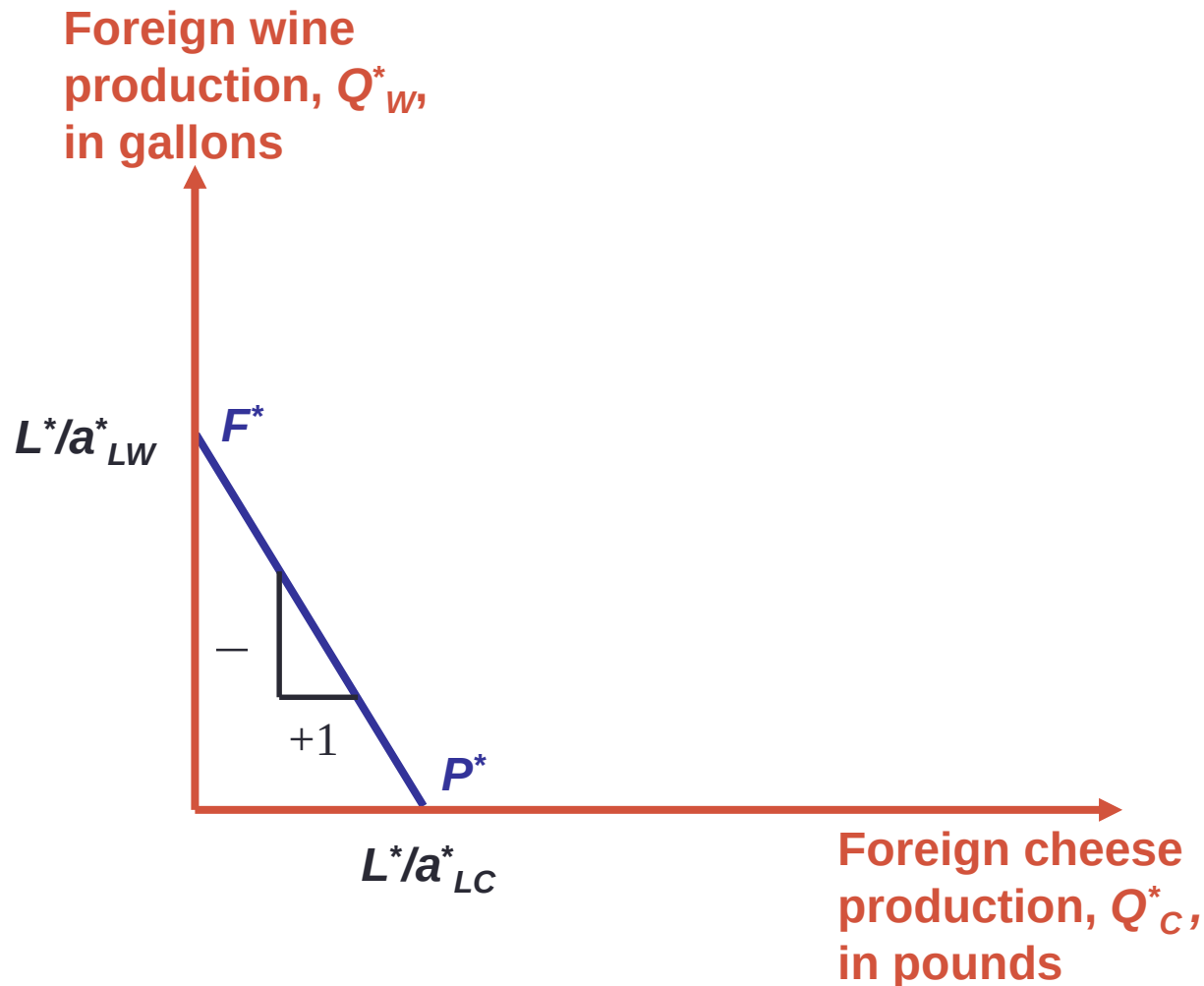
$$a_{LC}Q_C + a_{LW}Q_W = L$$

- Here, we get: $Q_C + 2Q_W = 120$

Home's Production Possibility Frontier



Foreign's Production Possibility Frontier



Relative Prices and Supply

- The particular amounts of each good produced are determined by prices.
- The relative price of good X (cheese) in terms of good Y (wine) is the amount of good Y (wine) that can be exchanged for one unit of good X (cheese).

Relative Prices and Supply

- Given
 - P_C the dollar price of cheese
 - P_W the dollar price of wine.
 - w_C the dollar wage in the cheese industry.
 - w_W the dollar wage in the wine industry.
- Recall $MC = MR$ condition of profit maximisation
- Then under perfect competition, the non-negative profit condition implies:
 - Production of Q_W shall take place only if $P_W / a_{LW} \geq w_W$
 - Production of Q_C shall take place only if $P_C / a_{LC} \geq w_C$

Relative Prices and Supply

- In the absence of trade, both goods are produced, and perfect competition will ensure $P = MC$. That is $P_C / P_W = a_{LC} / a_{LW}$.
- If $(P_C / P_W) > (a_{LC} / a_{LW})$, then the economy will specialise in the production of cheese.

Trade in a One-Factor World

- Assume that $a_{LC} / a_{LW} < a_{LC}^* / a_{LW}^*$
 - This assumption implies that the opportunity cost of cheese in terms of wine is *lower in Home* than it is in Foreign.
 - In other words, in the absence of trade, the relative price of cheese at Home is lower than the relative price of cheese at Foreign.
- Home has a comparative advantage in cheese and will export it to Foreign in exchange for wine.

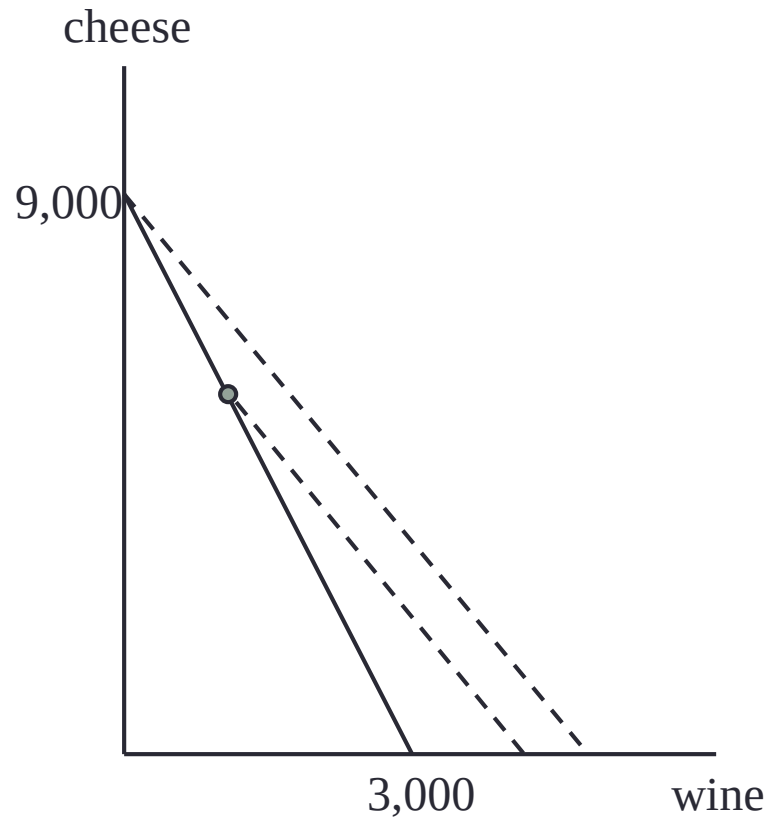
Gains from Trade

- If countries specialise according to their comparative advantage, they all gain from this specialisation and trade.
- We will demonstrate these gains from trade in two ways.
 - First, we can think of a new way of producing goods and services (that is, a new technology).
 - Another way to see the gains from trade is to consider how trade affects consumption in each of the two countries.

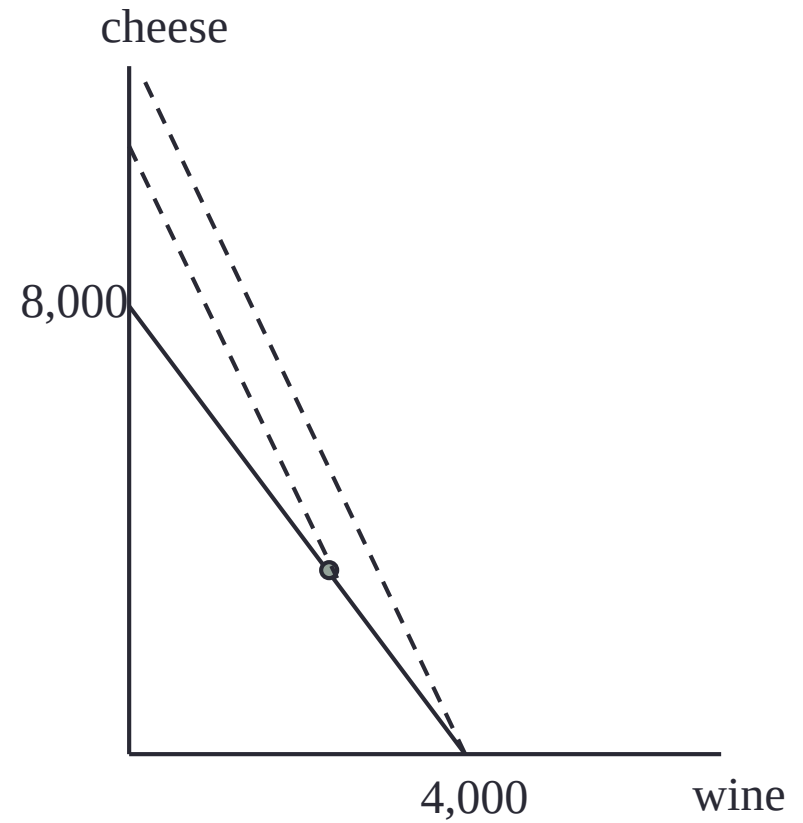
Gains from Trade: Expansion of Consumption

- The consumption possibility frontier states the maximum amount of consumption of a good a country can obtain for any given amount of the other commodity.
- In the absence of trade, the consumption possibility curve is the same as the production possibility curve.
- Trade **enlarges the consumption possibility** for each of the two countries.

After trade



Portugal



England

A Numerical Example

The following table describes production conditions in the two counties:

Unit Labour Requirements

	Cheese	Wine
Home	$a_{LC} = 1$ hour per pound	$a_{LW} = 2$ hours per gallon
Foreign	$a_{LC}^* = 6$ hours per pound	$a_{LW}^* = 3$ hours per gallon

- Home has lower unit labour requirements (higher labour productivity) in both industries.
- The numerical example implies that:

$$a_{LC} / a_{LW} = 1/2 < a_{LC}^* / a_{LW}^* = 2$$

- That is, relative world price that allows trade is

$$1/2 < P_C / P_W < 2$$

Trade in a One-Factor World

- In world equilibrium, the relative price of cheese must lie between these values. Assume that $P_c/P_w = 1$ gallon of wine per pound of cheese.
- Both countries will specialise and gain from this specialisation.
 - Consider Home, which can transform wine to cheese by either producing it internally or by producing cheese and then trading the cheese for wine.
 - Home can use one hour of labor to produce $1/a_{LW} = 1/2$ gallon of wine if it does not trade.
 - Alternatively, it can use one hour of labour to produce $1/a_{LC} = 1$ pound of cheese, sell this amount to Foreign, and obtain 1 gallon of wine. In this case, it saves !

Trade in a One-Factor World

- In the absence of trade, **Foreign** can use one unit of labour to produce $1/a_{LC}^* = 1/6$ pound of cheese using the domestic technology.
- Can it do better by specialising in wine and trading wine with Home for cheese?
 - In the presence of trade, Foreign can use one unit of labour to produce $1/a_{LW}^* = 1/3$ gallon of wine.
 - Since the world price of wine is $P_W / P_C = 1$ pound of cheese per gallon, Foreign can obtain $1/3$ lb of cheese which is more than $1/6$ lb.
 - So it's better off !

Terms of Trade

- TOT = the relative price of the exported commodity.
- The precise TOT reflects relative demand.
- Important for distribution of the gains between the countries.
- The closer the TOT are to a country's internal autarky price ratio, the smaller the gains for that country from int'l trade.
- Equilibrium TOT should bring about balanced trade.
 - Unfortunately, Ricardo didn't suggest how to establish equi TOT.
 - Determination of equi. TOT must be made by the comparative strength and Ed of each country for other's product (reciprocal demand) → offer curve.

Incorporating Wage Rates and An Exchange Rate

- Now we shall assign monetary value to product: $V_i = a_i * w$
- Once price and exchange rate are specified, a unique TOT can be specified.
- If $a_{Ai}w_Ae < a_{Bi}w_B$, then country A can export i if and only if

$$\frac{a_{Ai}}{a_{Bi}} < \frac{w_B}{w_A * e}$$

Incorporating Wage Rates and An Exchange Rate

$$\frac{a_{Ai}}{a_{Bi}} < \frac{w_B}{w_A * e}$$

- This implies potential trade flows depend on
 - Relative labour efficiency
 - Relative wage rates
 - The exchange rate
- Changes in the wage rate can alter the degree of cost advantage to a country.

Given exchange rate:
1USD = Y100

Country	Wage/h r	Wine		Cheese	
		Labour (hrs/unit)	Price	Labour (hrs/unit)	Price
USA	\$1	1	\$1	3	\$3
Japan	Y50	3	Y150	4	Y200

- For wine: $\frac{a_{Ui}}{a_{Ji}} = \frac{1}{3}$
- For cheese: $\frac{a_{Ui}}{a_{Ji}} = \frac{3}{4}$

$$\left. \begin{array}{l} \frac{a_{Ui}}{a_{Ji}} = \frac{1}{3} \\ \frac{a_{Ui}}{a_{Ji}} = \frac{3}{4} \end{array} \right\} \frac{w_J}{w_U * e} = \frac{50}{1 * 100} = \frac{1}{2}$$

So USA exports wine and Japan exports cheese.
What if e changes to 1USD = Y50?

Comparative Advantage with Many Goods

- **Setting Up the Model**

- Both countries consume and are able to produce a large number, N , of different goods.

- **Relative Wages and Specialisation**

- Goods will always be produced where it is cheapest to make them.
 - For example, it will be cheaper to produce good i in Home if $wa_{Li} < w^*a_{Li}^*$, or by rearranging if $a_{Li}^*/a_{Li} > w/w^*$.

With an exchange rate: USD0.8 = 1euro

	France (euros)	USA (\$)	a_{Fi}/a_{Ui}
Wage/hr	2	3.2	
Production (labour requirement: hrs)			
Wine	4	3	1.3
Cloth	6	5	1.2
Hardware	24	10	2.4
Wheat	5	5	1.0
Cheese	7	3	2.3
Poultry	12	4	3.0

$$\begin{aligned}
 \frac{w_U}{w_F * e} &= \frac{3.2}{2 * 0.8} \\
 &= \frac{3.2}{1.6} \\
 &= 2
 \end{aligned}$$

With an exchange rate: USD0.8 = 1euro

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Wage/hr	2	3.2	
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With an exchange rate: USD0.8 = 1euro

Labour requirements in France

$$\frac{w_U}{w_F * e} = 2$$



Wheat
(1.0)

Cloth
(1.2)

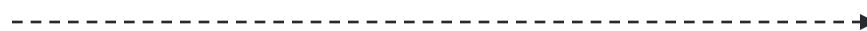
Wine
(1.3)

Cheese
(2.3)

Hardware
(2.4)

Poultry
(3.0)

The most CA



The least CA

Suppose now an increased preferences for leisure causes the wage rate in USA to rise to \$4/hour.

With an exchange rate: USD0.8 = 1euro

Labour requirements in France

$$\frac{w_U}{w_F * e} = \frac{4.0}{2(0.8)} = 2.5$$

Wheat (1.0)	Cloth (1.2)	Wine (1.3)		Cheese (2.3)	Hardware (2.4)	Poultry (3.0)
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The most CA -----> The least CA

USA's cost advantage in cheese and hardware has been eroded.

Incorporation of Transportation Cost

- Assume:
 - All transport costs paid by importers
 - Transport costs are measured in terms of their labour content → so perceived as increasing amount of relative labour required per unit of output in the exporting country.
- Now export conditions become:
$$\frac{a_{Ai} + tr_i}{a_{Bi}} < \frac{w_B}{w_A * e}$$
- This allows for the possibility that certain commodities might not be imported by either country.

Recall this example:
 given $e = \text{US\$}0.8 = 1 \text{ euro}$ and
 transport cost = 3 labour hours.

	France (euros)	USA (\$)	a_{Fi}/a_{Ui}
Wage/hr	2	3.2	
Production (labour requirement: hrs)			
Wine	4	3	1.3
Cloth	6	5	1.2
Hardware	24	10	2.4
Wheat	5	5	1.0
Cheese	7	3	2.3
Poultry	12	4	3.0

$$\begin{aligned}
 \frac{w_U}{w_F * e} &= \frac{3.2}{2 * 0.8} \\
 &= \frac{3.2}{1.6} \\
 &= 2
 \end{aligned}$$

Recall this example:
 given $e = \text{US\$}0.8 = 1 \text{ euro}$ and
 transport cost = 3 labour hours.

	France (euros)	USA (\$)	$a_{Fi} + tr / a_{Ui}$
Wage/hr	2	3.2	
Production (labour requirement: hrs)			
Wine	4+3	3	2.3
Cloth	6+3	5	1.8
Hardware	24+3	10	2.7
Wheat	5+3	5	1.6
Cheese	7+3	3	3.3
Poultry	12+3	4	3.75

$$\begin{aligned}
 \frac{w_U}{w_F * e} &= \frac{3.2}{2 * 0.8} \\
 &= \frac{3.2}{1.6} \\
 &= 2
 \end{aligned}$$

With a transport cost = 3 labour hours

Labour requirements in France

$$\frac{w_U}{w_F * e} = 2$$



Wheat	Cloth		Wine	Hardware	Cheese	Poultry
(1.6)	(1.8)		(2.3)	(2.7)	(3.3)	(3.75)

The most CA -----> The least CA

Now the comparative advantage in producing wine is overcome by the cost of transportation. So wine becomes a non-traded good even though it is a tradable good !

Adding Transport Costs

- The result of introducing transport costs makes some goods **nontradable**, esp bulky and heavy products.
- In some cases transportation is virtually impossible.
 - Example: Services such as haircuts and auto repair cannot be traded internationally.
- There are three main reasons why specialisation in the real international economy is not extreme:
 - The existence of more than one factor of production.
 - Countries sometimes protect industries from foreign competition.
 - It is costly to transport goods and services.

Trade between multiple countries

- Two-good, three-country Ricardian framework

	Labour requirement (hrs)		Autarky price ratio
	Fish	Poultry	
Sweden	4	10	1P:2.5F
Germany	5	15	1P:3F
France	5	20	1P:4F

Equilibrium TOT should be somewhere between 1P:2.5F and 1P:4F. ➔ ambiguity in the pattern of trade exists until the ultimate equilibrium TOT are specified.

Comments on the classical theory of trade

- Based on the labour theory of value
 - Goods exchange for one another according to the relative amounts of labour they embody.
- Oversimplification
 - Labour is not homogeneous.
 - Labour is not the sole factor of production.
 - The cost of commodity includes not only the cost of factors, but also the length of time that labour is invested in production.

Comments on the classical theory of trade

- Seriously incomplete
 - While the model bases trade on differences in productivity levels between countries, nowhere does it explain why these differences exist.
- Upon complete specialisation
 - In reality, countries still produce import-competing goods.

Decomposition of Gains from Trade

- Total gains from trade
- Equals consumption gains (from exchange)
 - Even if production remains unchanged, the new relative prices enhance welfare of the country
- Plus production gains (from specialisation)
 - Provided that factor movement is possible between industries, further gain occurs.

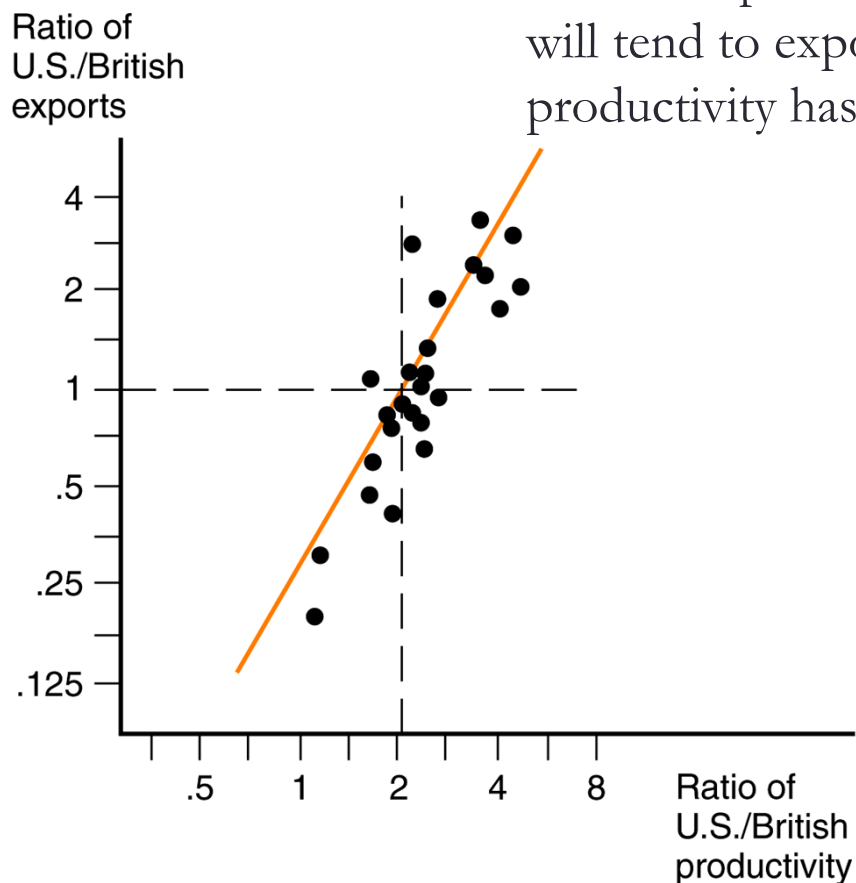
Empirical Evidence on the Ricardian Model

- The link between relative labour productivity, relative wages, and the structure of exports.
- In practice,

$$\begin{aligned} \text{unit labour cost} &= \text{labour cost per unit of output} \\ &= \frac{\text{total wage bill (incl fringe benefits)}}{\text{industry's output}} \end{aligned}$$

Empirical Evidence on the Ricardian Model

The basic prediction of the Ricardian model that countries will tend to export goods in which they have relatively high productivity has been confirmed by a number of studies.



Productivity and Exports

Revealed Comparative Advantage

- Balassa (1974)

$$RCA_i = 100 * \frac{(X_i / X_{iw})}{(X / X_w)}$$

X_i is the value of a country's exports of commodity i ;

X_{iw} is the value of total world exports of commodity i .

X is the value of a country's exports in all commodities;

X_w is the value of total world exports in all commodities.

So RCA measures ratio of the share of a country in exporting i to the country's share of trade in all goods.

Revealed Comparative Advantage

- Yilmaz (2003)

$$RCA = \ln \left[\frac{X_i}{M_i} \right] \left(\frac{\sum_{i=1}^n X_i}{\sum_{i=1}^n M_i} \right) * 100$$

M_i is the value of a country's imports of commodity i ;

Findings: RCA between Thailand and new accession countries of the EU

HS-2 digit	2	7	16	40	61	62	64	71	84	85	87
Malta	X=0	-156.48	X=0	53.37	-52.3	72.24	48.01	-142.32	-71.49	-43.68	-17.15
Estonia	-207.04	-286.28	45.03	-96.15	51.18	101.65	-26.19	22.47	-128.73	14.09	-129.31
Latvia	X=0	-414.78	7.5	-105.11	85.76	126.3	-311.26	27.7	-220.87	-185.14	-285.78
Lithuania	-168.93	-178.29	160.14	-205.78	117.77	166.56	-58.47	278.89	-213.31	-52.54	-199.44
Poland	113.83	29.57	113.87	40.87	63.09	132.79	-14.49	164.26	-46.17	-11.38	-36.31
Czech Rep.	-181.14	-339.41	-361.67	26.7	9.52	45.66	-8.63	62.84	6.27	13.56	21.42
Slovakia	-340.75	-378.62	-269.22	102.95	154.24	285.98	194.31	-128.82	-48.07	6.84	101.47
Hungary	163.38	23.8	200.44	29.86	56.34	148.71	88.47	-37.06	32.07	42.1	-66.3
Slovenia	-60.56	-482.7	57.58	80.42	-7.73	67.15	-33.4	-138.94	-38.75	10.66	1.59
Cyprus	-43.57	29.03	-117.36	-116.12	-64.82	-20.6	-118.51	-43.43	-82.88	-76.85	-18.59
Thailand	657.04	843.89	1117.98	355.28	708.7	588.55	678.49	148.68	47.09	125.94	181.69

Source: Wisawaisuan (2004)

Interpretation

- Thailand:
 - $RCA > 0$ in all product lines, indicating Thailand's comparative advantage over European countries.
- New members
 - Poland possesses comparative advantage in all but electric, electronic, (84, 85), auto (87) and footwear (64).
 - Hungary loses former EU-15 only in the lines of auto (87) and jewelry (71).
 - All new members (except Cyprus) have comparative advantage in producing textiles and garment.

Summary

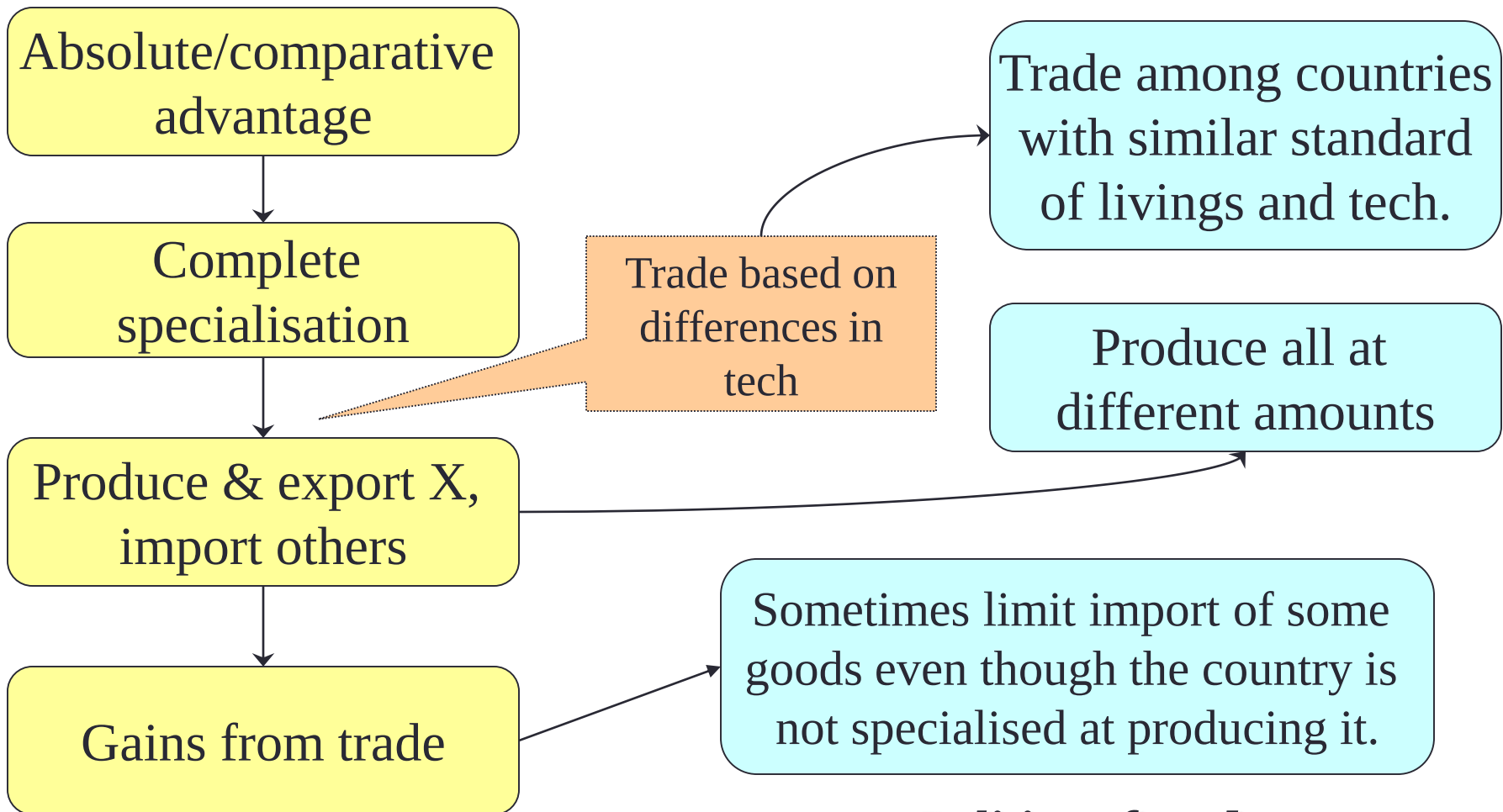
- We examined the Ricardian model, the simplest model that shows how differences between countries give rise to trade and gains from trade.
- In this model, labour is the only factor of production and countries differ only in the productivity of labor in different industries.
- In the Ricardian model, a country will export that commodity in which it has comparative (as opposed to absolute) labour productivity advantage.
- Extending the one-factor, two-good model to a world of many commodities makes it possible to illustrate that transportation costs can give rise to the existence of nontraded goods.

Summary

- The fact that trade benefits a country can be shown in either of two ways:
 - We can think of trade as an indirect method of production.
 - We can show that trade enlarges a country's consumption possibilities.
- The distribution of the gains from trade depends on the relative prices of the goods countries produce.

Theory

Practice/Facts



Politics of trade