INTERNATIONAL TRADE

Chapter 3:

LABOR PRODUCTIVITY AND COMPARATIVE ADVANTAGE: THE RICARDIAN MODEL

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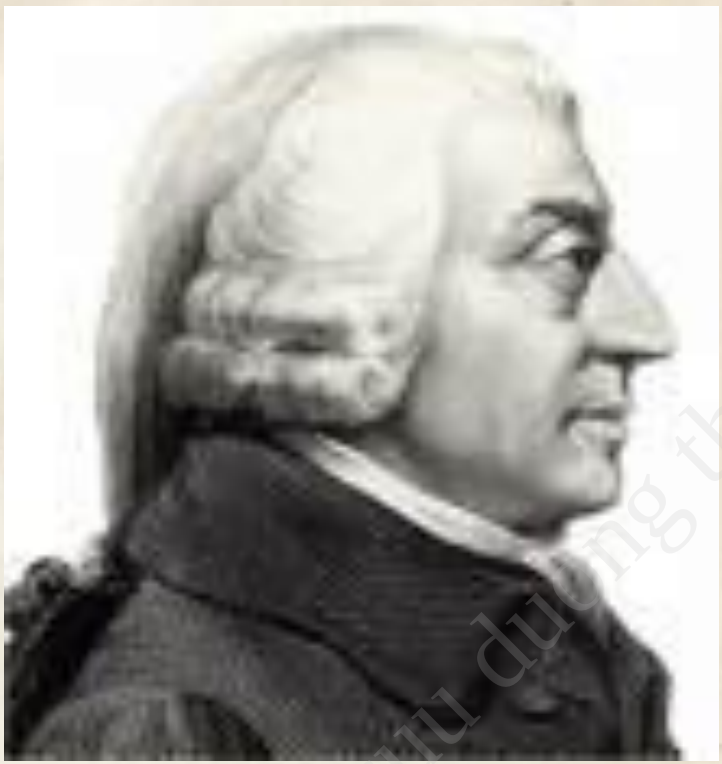
Main contents

THE CONCEPT OF COMPARATIVE ADVANTAGE



Adam Smith

(1723-1790)

“Absolute advantage” “Invisible hands”

AN

INQUIRY

INTO THE

NATURE AND CAUSES

OF THE

WEALTH OF NATIONS.

By ADAM SMITH, LL. D.

WITH A LIFE OF THE AUTHOR,
AN INTRODUCTORY DISCOURSE, NOTES, AND
SUPPLEMENTAL DISSERTATIONS.

By J. R. M'CULLOCH, Esq.
PROFESSOR OF POLITICAL ECONOMY IN THE UNIVERSITY OF LONDON.

IN FOUR VOLUMES.
VOL. I.

EDINBURGH:
PRINTED FOR ADAM BLACK, AND WILLIAM TAIT;
AND LONGMAN, REES, ORME, BROWN, AND GREEN,
LONDON.

M.DCCC.XXVIII.

Absolute advantage

- Adam Smith:
  - trade between countries is based upon absolute advantage
- When one country is more efficient than another in the production of a commodity but less efficient than the other country in the production of another commodity, then both countries can gain from **specializing** in the production of the commodity of its **absolute advantage**

Illustration of absolute advantage

	US	UK
Wheat - W (bushels/hour of labor)	6	1
Cloth – C (meters/hour of labor)	4	5

- The US has an absolute advantage over the UK in wheat production
- The UK has an absolute advantage over the US in cloth production
- The US would specialize in wheat and the UK in cloth production.
- Assume that the US and the UK decide to exchange 6W for 6C
  - The US would be better off by 2m of cloth (6 -4 = 2)
  - The UK would be ahead by 24m of cloth (6x5 – 6 = 24)

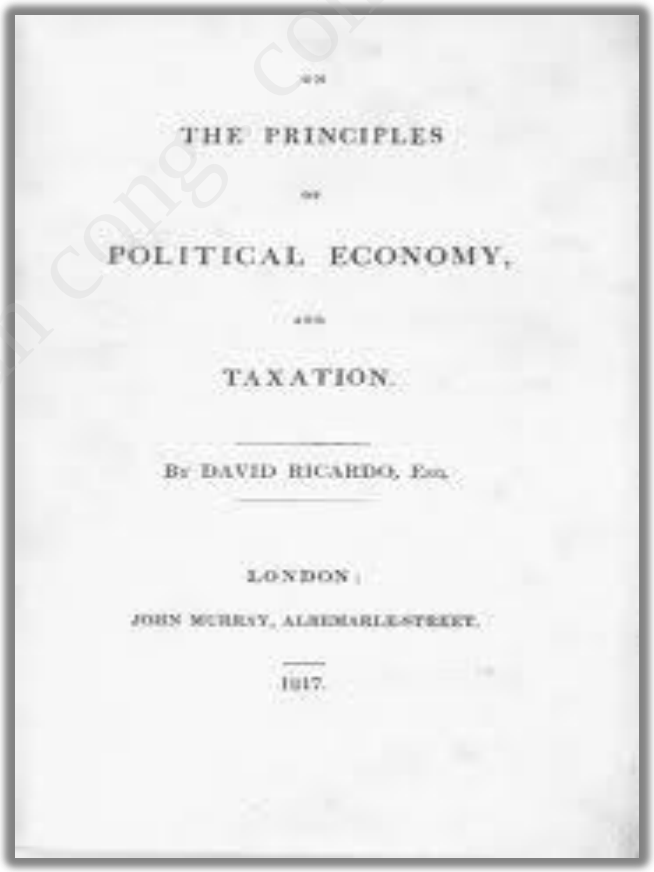
$\Rightarrow$ Both nations gain, but the UK gain more.

Disadvantage of absolute advantage theory

	US	UK
Wheat - W (bushels/hour of labor)	6	1
Cloth – C (meters/hour of labor)	4	2

- It cannot explain the trade in the case that one country has absolute advantage in both goods and the other does not have absolute advantage in any goods.
  - The US has absolute advantage in producing both wheat and cloth
  - The UK does have absolute advantage in producing any goods.

David Ricardo
(1772-1823)
“Comparative advantage”



ON

THE PRINCIPLES

OF

POLITICAL ECONOMY,

AND

TAXATION.

By DAVID RICARDO, Esq.

LONDON:

JOHN MURRAY, ALBEMARLE-STREET.

1817.

Comparative Advantage and Opportunity Cost

- The Ricardian model uses the concept of comparative advantage and opportunity cost to explain why it is the interests of countries to trade.
- The opportunity cost of producing something measures the cost of not being able to produce something else
  - E.g. An enterprise: 1 hour can produce 1 ton of rice or 1/4 ton of steel -> OC of producing 1 ton of rice?

Comparative Advantage and Opportunity Cost (cont.)

- The model: two countries, two commodities, one factor model.
- A country faces opportunity costs when it employs resources to produce goods and services.

	The US	The UK
Wheat - W (bushels/hour of labor)	6	1
Cloth – C (meters/hour of labor)	4	2

- Determine the opportunity cost of Wheat and Cloth in the US and the UK

Comparative Advantage and Opportunity Cost (cont.)

- The US has a lower opportunity cost in producing wheat
  - OC of producing wheat in US = 2/3 cloth
  - OC of producing wheat in UK = 2 cloth
- The UK has a lower opportunity cost in producing cloth
  - OC of producing cloth in US = 3/2 wheat
  - OC of producing cloth in UK = 1/2 wheat

Comparative Advantage and Opportunity Cost (cont.)

- A country has a **comparative advantage** in producing a good if the opportunity cost of producing that good is lower in the country than it is in other countries.
- A country with a comparative advantage in producing a good uses its resources most efficiently when it produces that good *compared to producing other goods*.

Comparative Advantage and Opportunity Cost (cont.)

- The US
  - has a comparative advantage in wheat production
  - uses its resources more efficiently in producing wheat compared to other uses.
- The UK
  - has a comparative advantage in cloth production
  - it uses its resources more efficiently in producing cloth compared to other uses.
- Suppose **initially that the US and the UK produce both goods as** they want to consume the both goods.

Comparative Advantage and Trade

When countries specialize in production in which they have a comparative advantage, more goods can be produced and consumed.

	Bushels of wheat	Meters of Cloth
The US	+ 6	- 4
The UK	- 6	+ 12
Total	0	+8

A ONE FACTOR RICARDIAN MODEL

Assumptions

1. Only two countries are modeled: Home and Foreign.
2. Only two goods: wine and cheese.
3. Labor is the only production factor
4. Labor productivity varies across countries, usually due to differences in technology, but labor productivity in each country is constant across time.
5. The supply of labor in each country is constant.
6. Labor is fully employed and mobile between industries.
7. Competition allows laborers to be paid a “competitive” wage, a function of their productivity and the price of the good that they can sell, and allows laborers to work in the industry that pays the highest wage.

Unit labor requirement

- **An unit labor requirement:** the constant number of hours of labor required to produce one unit of output.
  - a_{LC} : the unit labor requirement for producing cheese in the domestic country.
  - a_{LW} : the unit labor requirement for producing wine in the domestic country.
  - E.g. $a_{LC} = 2$: It takes 2 hours to produce 1 unit of cheese in the domestic country.
  - A high unit labor requirement means lower labor productivity.

Production Possibilities

- The **production possibility frontier** (PPF) of an economy shows the *maximum* amount of goods that can be produced for a fixed amount of resources.
- The total number of labor hours worked in the domestic country: *L.*
- Q_C : the quantity of cheese produced
- Q_W: the quantity of wine produced,
- Then the production possibility frontier of the domestic economy has the equation:

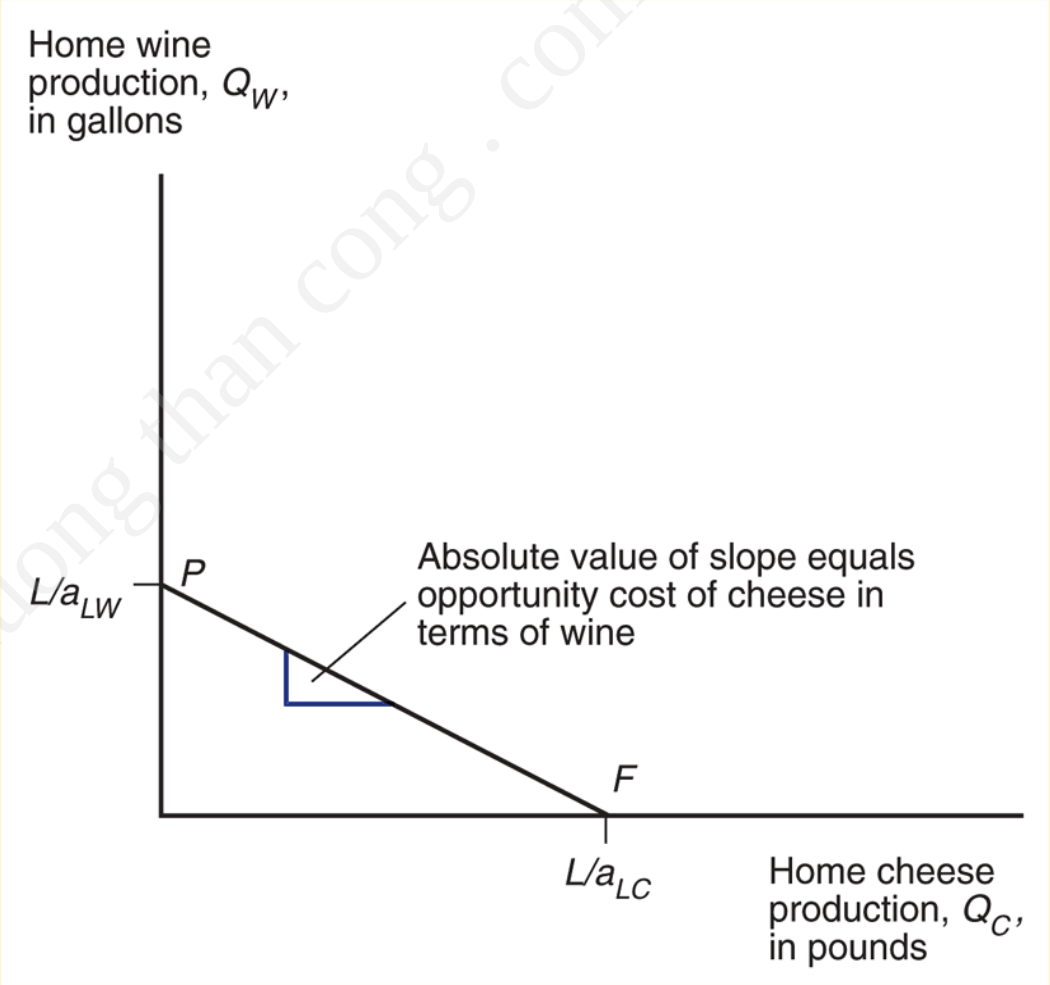
$$a_{LC}Q_C + a_{LW}Q_W = L$$

Production Possibilities (cont.)

Figure 3-1

Home's Production Possibility Frontier

The line *PF* shows the maximum amount of cheese Home can produce given any production of wine, and vice versa.



Production Possibilities (cont.)

- In general, the amount of the domestic economy's production is defined by
  $a_{LC}Q_C + a_{LW}Q_W \leq L$
- This describes what an economy **can produce**
- To determine **what the economy does produce, we must determine the prices of goods.**

Production and Price

- *Hourly wages*
- P_C *:* the price of cheese
- P_W: the price of wine.
- Because of competition:
  - hourly wage of cheese makers are equal to the market value of the cheese produced in an hour: P_c/a_{LC}
  - hourly wage of wine makers are equal to the market value of the wine produced in an hour: P_W/a_{LW}
- Because workers like high wages, they will work in the industry that pays a higher hourly wage.

Production and Prices (cont.)

- If $P_C/a_{LC} > P_W/a_{LW}$ => $P_C/P_W > a_{LC}/a_{LW}$
  - workers will make only 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.**

Production and Prices (cont.)

- If $P_C/a_{LC} < P_W/a_{LW} \Rightarrow P_C/P_W < a_{LC}/a_{LW}$
  - workers will only make wine.
- **The economy will specialize in wine production if the price of wine relative to the price of cheese exceeds the opportunity cost of producing wine.**

Production and Prices (cont.)

- If $P_C/a_{LC} = P_W/a_{LW}$ workers will have no incentive to flock to either the cheese industry or the wine industry, thereby maintaining a positive amount of production of both goods.
- $P_C/P_W = a_{LC}/a_{LW}$
- Production (and consumption) of both goods occurs when relative price of a good equals the opportunity cost of producing that good.
- Relative prices must be adjusted so that wages are equal in the wine and cheese industries.

Wages in autarky

- In autarky, each nation should produce both products to serve consumers' demand.
- If the domestic country wants to consume both wine and cheese (in the absence of international trade) then

$P_C/a_{LC} = P_W/a_{LW}$

$\Rightarrow P_C/P_W = a_{LC}/a_{LW}$ *(relative price of cheese is equal to opportunity cost of producing cheese)*

- Workers will have no incentive to flock to either the cheese industry or the wine industry, thereby maintaining a positive amount of production of both goods.

Wages in autarky (cont.)

⇒In autarky, if a nation wants to consume both wine and cheese, then **Relative prices must be adjusted so that wages are equal in the wine and cheese industries.**

⇒In other words, production (and consumption) of both goods occurs when **relative price of a good equals the opportunity cost of producing that good.**

Note

- If relative price of a good is higher than the opportunity cost of producing that good => a nation will specialize in producing that good.
- If relative price of a good equals the opportunity cost of producing that good, a nation will produce both goods.

TRADE IN ONE FACTOR MODEL

Assumption

- Suppose that the domestic country has a comparative advantage in cheese production: (its opportunity cost of producing cheese is lower than it is in the foreign country).

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

where "*" notates foreign country variables

Trade in the Ricardian Model (cont.)

- To see how all countries can benefit from trade, we calculate relative prices when trade exists.
  - Without trade, relative price of a good equals the opportunity cost of producing that good.
  - With trade, the relative price is between the relative prices without trade in two countries:

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

Relative Supply and Relative Demand (cont.)

- *When* $P_C/P_W < a_{LC}/a_{LW} < a_{LC}^*/a_{LW}^* \Rightarrow$ There is no supply of cheese.
  - Home will specialize in wine production whenever $P_C/P_W < a_{LC}/a_{LW}$
  - And we assumed that $a_{LC}/a_{LW} < a^*_{LC}/a^*_{LW}$ so Foreign won't find it desirable to produce cheese either.
- When $P_C/P_W = a_{LC}/a_{LW}$, Home will be indifferent between producing wine or cheese, but Foreign will still produce only wine.
  - Relative supply of wine of the world will be between 0 and $L/a_{LC}/L^*/a^*_{LW}$

Gains From Trade

- Gains from trade come from
  - specializing in production that use resources most efficiently (means producing a good in which a country has a comparative advantage).
  - using the income generated from that production to buy the goods and services that countries desire.

$\Rightarrow$Trade: an indirect method of production - converting cheese into wine or vice versa.

Gains From Trade (cont.)

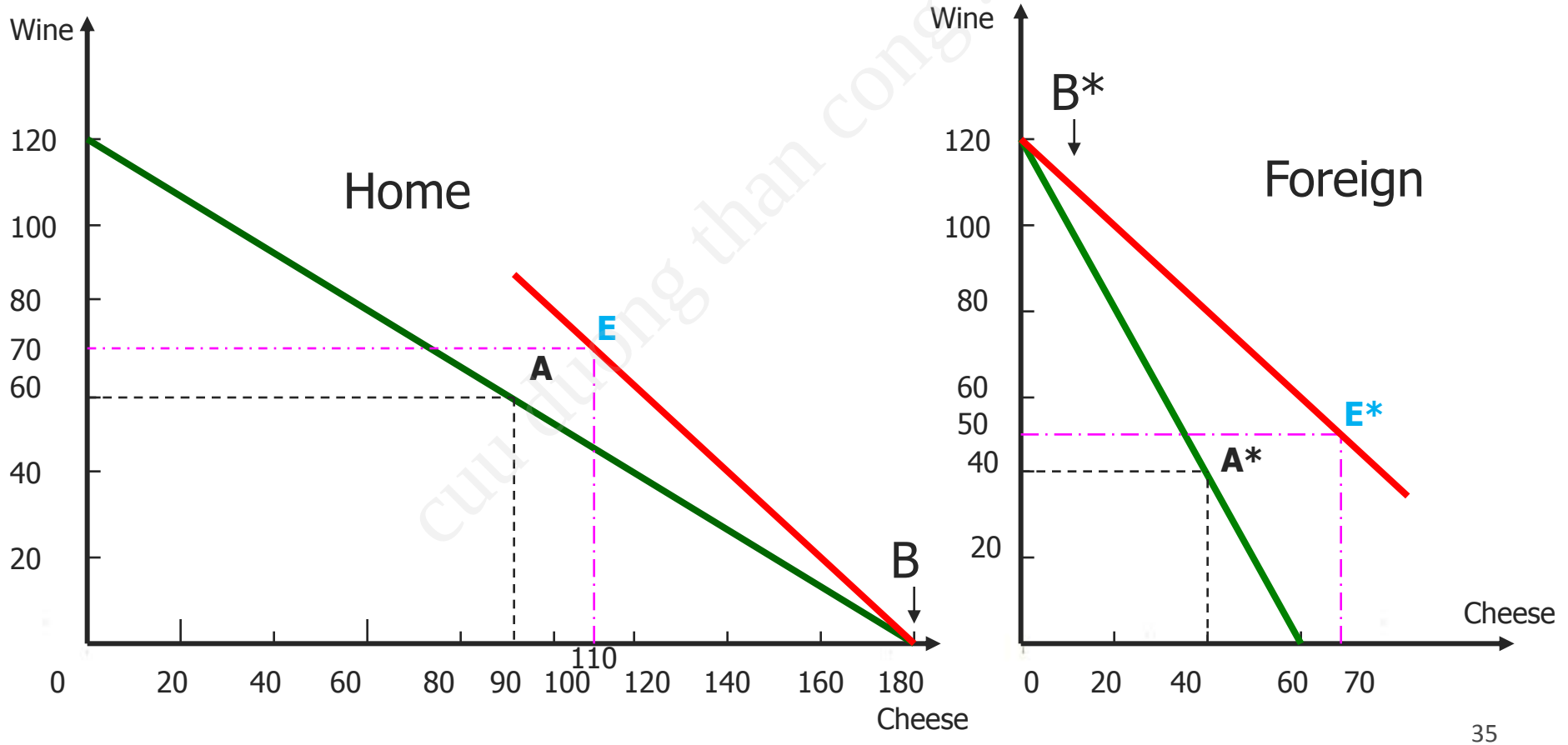
- Benefits for workesrs:
  - Domestic workers earn a higher income from cheese production because the relative price of cheese increases with trade.
  - Foreign workers earn a higher income from wine production because the relative price of cheese decreases with trade (making cheese cheaper) and the relative price of wine increases with trade.

Gains From Trade (cont.)

- Expansion of consumption possibilities
  - Without trade, consumption is restricted to what is produced.
  - With trade, consumption in each country is expanded because world production is expanded when each country specializes in producing the good in which it has a comparative advantage.

Gains From Trade (cont.)

Trade expands consumption possibilities: International trade allows Home and Foreign to consume anywhere within the red lines, which lie outside the countries' PPF



Relative Wages

- Political discussion of international trade: comparison of wage rates in different countries (Mexico: 2$ per hour compared with 15$ in the US).
- **Relative wages** are the wages of the domestic country relative to the wages in the foreign country.
- Although the Ricardian model predicts that relative prices equalize across countries after trade, it does not predict that relative wages will do the same.
- Productivity differences determine wage differences in the Ricardian model.
  - A country with absolute advantage in producing a good will enjoy a higher wage in that industry after trade.

Recall from the earlier numerical example

Unit labor requirements for domestic and foreign countries		
	Cheese	Wine
Domestic	a_{LC} = 1 hour/kg	a_{LW} = 2 hours/L
Foreign	a^*_{LC} = 6 hours/kg	a^*_{LW} = 3 hours/L

- $a_{LC}/a_{LW} = 1/2 < a^*_{LC}/a^*_{LW} = 2$
- Home: cheese production
- Foreign: wine production

Relative Wages (cont.)

- Suppose that P_C = \$12/kg and P_W = \$12/l
- After trade, domestic workers specialize in cheese production, their hourly wages will be

$$P_C/a_{LC} = \$12/1 = \$12$$

- After trade, foreign workers specialize in wine production, their hourly wages will be

$$P_W/a^*_{LW} = \$12/3 = \$4$$

- The relative wage of domestic workers is therefore

$$\$12/\$4 = 3$$

Relative Wages (cont.)

- The relative wage lies between the ratio of the productivities in each industry.
  - Home is 6/1 = 6 times as productive in Foreign in cheese production,
  - But Home is only 3/2 = 1.5 times as productive as Foreign in wine production.
  - Relative wage of Home is three times as high as Foreign's.

Relative Wages (cont.)

- Home workers have a cost advantage in cheese
  - Home cheese workers have a higher productivity
  - Home has high wages relative to Foreign

$\Rightarrow$ The cost of high wage can be offset by high productivity

- Foreign workers have a wage that is only 1/3 of the Home workers
  - Foreign workers have a cost advantage (in wine production)
  - Foreign has lower productivity

=> The cost of low productivity can be offset by low wage.

Do Wages Reflect Productivity?

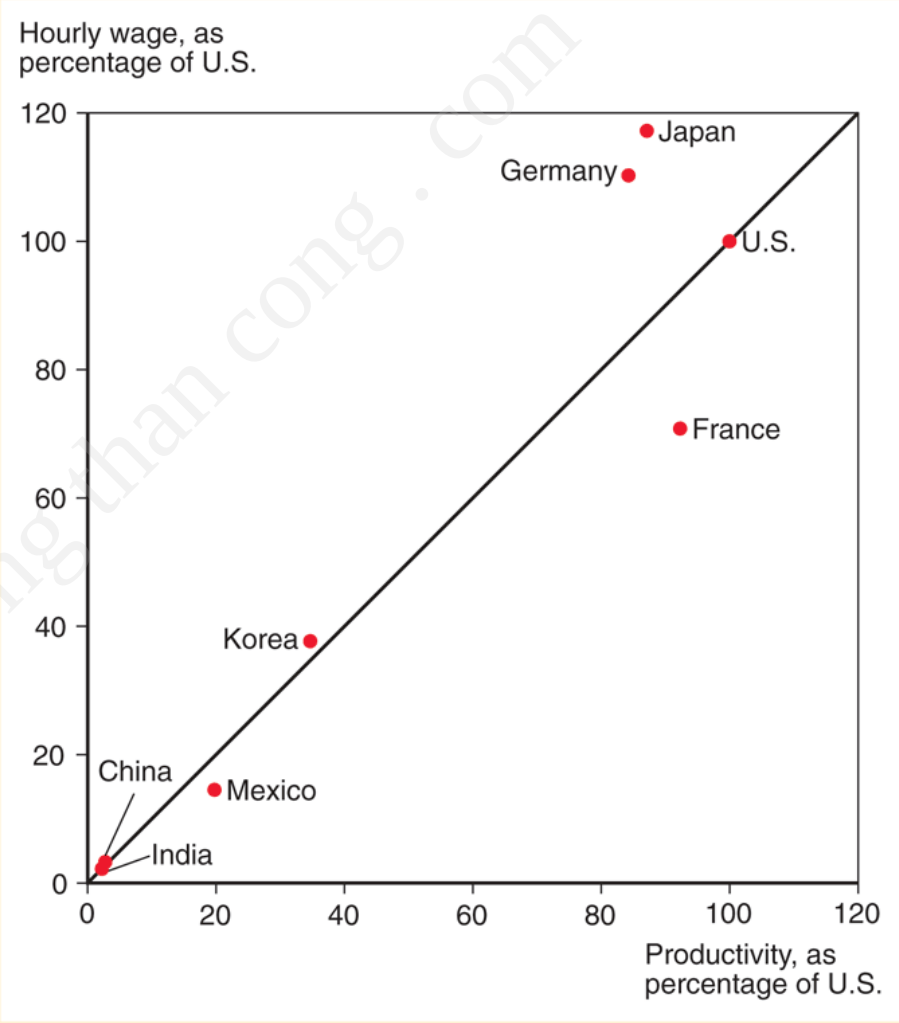
- In the Ricardian model, relative wages reflect relative productivities of the two countries.
- Is this an accurate assumption?
- Some argue that low wage countries pay low wages despite growing productivity, putting high wage countries at a cost disadvantage.
- But evidence shows that low wages are associated with low productivity.

Do Wages Reflect Productivity? (cont.)

Productivity and Wages

A country's wage rate is roughly proportional to the country's productivity.

Source: International Labor Organization, World Bank, Bureau of Labor Statistics, and Orley Ashenfelter and Stepan Jurajda, "Cross-country Comparisons of Wage Rates," working paper, Princeton University.



MISCONCEPTIONS ABOUT COMPARATIVE ADVANTAGE

Misconceptions About Comparative Advantage

1. Free trade is beneficial only if a country is more productive than foreign countries.
   - "What if there is nothing you can produce more cheaply or efficiently than anywhere else, except by cutting constantly labor costs" .
   - Fail to understand the essential point of David Ricardo's model that "**The benefits of free trade do not depend on absolute advantage, rather they depend on comparative advantage: specializing in industries that use resources most efficiently".**
   - E.g: Foreign is not productive in both goods

Misconceptions About Comparative Advantage

2. Free trade with countries that pay low wages hurts high wage countries.
   - Pauper Labor Argument => favorable to labor unions seeking protection from foreign competition.
   - While trade may reduce wages for *some* workers, thereby affecting the distribution of income within a country, trade benefits consumers and other workers.
     - Consumers benefit because they can purchase goods more cheaply (more wine in exchange for cheese).
     - Producers/workers benefit by earning a higher income (by using resources more efficiently and through higher prices/wages).

Misconceptions About Comparative Advantage

3. Free trade exploits less productive countries and makes its worse off if its workers receive much lower wages than workers in other nations.
   - Whether low-wage workers and their countries are worse off through exporting goods based on low wage than they would be if they refused to enter in such demanding trade?
   - Deeper poverty and exploitation (e.g., involuntary prostitution) may result without export production.
   - Consumers benefit from free trade by having access to cheaply (efficiently) produced goods.
   - Producers/workers benefit from having higher profits/wages—higher compared to the alternative.

COMPARATIVE ADVANTAGE WITH MANY GOODS

Comparative Advantage With Many Goods

- To move closer to reality: a model with a large number of goods.
- 2 countries: H and F; 1 factor: labor
- Suppose now there are *N* goods produced, indexed by $i = 1,2,\ldots N$.
- The unit labor requirement for good *i*
  - a_{Li} : Home
  - a^*_{Li}: Foreign
- $a_{L1}/a^*_{L1} < a_{L2}/a^*_{L2} < a_{L3}/a^*_{L3} < \ldots < a_{LN}/a^*_{LN}$

Comparative Advantage With Many Goods (Cont.)

- Trade pattern (who produces what) depends only on: the ratio of Home to Foreign wages.
- *w:* the wage rate in Home
- w^*: the wage rate in Foreign
- Rule: Goods will always be produced where it is cheaper to make them

Comparative Advantage With Many Goods (cont.)

- If $wa_{L1} < w^* a^*_{L1}$
  - then only Home will produce good 1, since total wage payments are less there.
- Or equivalently, if $a^*_{L1}/a_{L1} > w/w^*$
  - 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 (Home).
- If $a^*_{L1}/a_{L1} < w/w^*$
  - If the relative productivity of a country in producing a good is lower than the relative wage, then the good will be produced in the other country (Foreign).

Comparative Advantage With Many Goods (cont.)

- Suppose there are 5 goods produced in the world:

TABLE 3-3 Home and Foreign Unit Labor Requirements

Good	Home Unit Labor Requirement (a_{Li})	Foreign Unit Labor Requirement (a^*_{Li})	Relative Home Productivity Advantage (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

If $w/w^* = 3$, Home will produce apples, bananas, and caviar, while Foreign will produce dates and enchiladas.

Comparative Advantage With Many Goods (cont.)

- The domestic country has high productivity in apples, bananas, and caviar that give it a cost advantage, despite its high wage.
- The foreign country has low wages that give it a cost advantage, despite its low productivity in dates and enchiladas
- Pattern of trade: depends on the relative wages.

The one-factor Ricardian Model with two nations, two commodities can be generalized and are indeed applicable to the case of many nations and many commodities.

Transportation Costs and Non-traded Goods

- The Ricardian model predicts that countries should completely specialize in production.
- But this rarely happens for some reasons:
  1. More than one factor of production reduces the tendency of specialization (chapter 4)
  2. Protectionism (chapters 8–11)
  3. Transportation costs reduce or prevent trade, which may cause each country to produce the same good or service
  4. Non-traded goods: hair cut… (transportation is virtually impossible).
  5. Non-traded goods: High weight-to-value ratio (cement – not worth exporting or importing cement, even if it can be produced more cheaply abroad)

Summary

1. A country has a comparative advantage in producing a good if the opportunity cost of producing that good is lower in the country than it is in other countries.
   - A country with a comparative advantage in producing a good uses its resources most efficiently when it produces that good compared to producing other goods.
2. The Ricardian model focuses only on differences in the productivity of labor across countries, and it explains gains from trade using the concept of comparative advantage.
3. When countries specialize and trade according to the Ricardian model, the relative price of the produced good rises, income for workers rises and imported goods are less expensive for consumers.

Summary

4. Trade is predicted to benefit both high productivity and low productivity countries, although trade may change the distribution of income within countries.

5. High productivity or low wages give countries a cost advantage that allow them to produce efficiently.

6. Although empirical evidence supports trade based on comparative advantage, transportation costs and other factors prevent complete specialization in production.

END OF CHAPTER 3