# Chapter 3

## Labor Productivity and Comparative Advantage: The Ricardian Model

## Preview

- Opportunity costs and comparative advantage
- A one factor Ricardian model
  - Production possibilities
  - Gains from trade
  - Wages and trade
- Misconceptions about comparative advantage



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## Introduction

- Theories of why trade occurs can be grouped into three categories:
  - Market size and distance between markets determine how much countries buy and sell (Gravity model).
  - Differences in labor, physical capital, natural resources and technology create productive advantages for countries (Countries are different).
  - Economies of scale (larger is more efficient) create productive advantages for countries.

=> Practical international trade patterns reflect the interaction of all of these motives.

## Gravity model

- The gravity model postulates that, other things equal, the larger (and the more equal in size) and the closer the two countries are, the larger the volume of trade between them is expected to be.
- The volume of trade in goods increases with the size and proximity of trading partners.
- US: expect that US trade more with its neighbors Mexico and Canada than with similar but more distant nations
- US: expect that US trade more with large nations such as China and Japan than with smaller ones.

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## Gravity model (cont.)

| Country | Exports (billion USD) | Imports (billion USD) | Exports plus imports (billion USD) |
|---|---|---|---|
| Canada | 212.2 | 293.3 | 505.5 |
| Mexico | 120.3 | 172.1 | 292.4 |
| China | 41.8 | 234.5 | 276.3 |
| Japan | 53.3 | 138.0 | 191.3 |
| Germany | 33.6 | 84.6 | 118.2 |
| United Kingdom | 376 | 50.5 | 88.1 |
| South Korea | 27.1 | 43.8 | 70.9 |
| Taiwan | 21.5 | 34.8 | 56.3 |
| France | 22.3 | 33.8 | 56.1 |
| Italia | 11.2 | 31.0 | 41.2 |

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## Introduction (cont.)

- Theory of Group 2
  - The Ricardian model (chapter 3) says **differences in *productivity of labor*** between countries cause productive differences, leading to gains from trade.
    - Differences in productivity are usually explained by differences in *technology*.
  - The Heckscher-Ohlin model (chapter 4) says **differences in labor, labor skills, physical capital and land** between countries cause productive differences, leading to gains from trade.

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## 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 (bushels/hour of labor) | 6 | 1 |
| Cloth (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

## Illustration of absolute advantage (cont.)

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

- The US would specialize in wheat and the UK in cloth production.
- The US would be better off by 2m of cloth
- The UK would be ahead by 24m of cloth

=> Both nations gain, but the UK gain more.

## Comparative Advantage and Opportunity Cost

- The Ricardian model uses the concepts of *opportunity cost* and *comparative advantage* 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.
  - Going to work and going to university
  - An enterprise: 1 hour can produce 2 tons of R or 10 tons of Steel => OC of producing a ton of R?
  - An enterprise: needs 2 hours to produce 1 R and 4 hours to produce 1 S => OC of producing a ton of R?

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## Comparative Advantage and Opportunity Cost (cont.)

- A country faces opportunity costs when it employs resources to produce goods and services.
- E.g: Opportunity costs related to roses and computers between the US and Ecuador.
- The model: two countries, two commodities, one factor model.



## Comparative Advantage and Opportunity Cost (cont.)

- Workers could be employed to produce either roses or computers
  - The opportunity cost of producing computers:
    - the amount of roses not produced.
  - The opportunity cost of producing roses:
    - the amount of computers not produced.
- A country faces a trade off: how many computers or roses should it produce with the limited resources that it has?

## Comparative Advantage and Opportunity Cost (cont.)

- Suppose:
  - US: **10 million roses** can be produced with the same resources that could produce **100,000 computers**.
  - Ecuador: **10 million roses** can be produced with the same resources that could produce **30,000 computers**.
- Quick quiz:
  - What are goods of comparative advantage of each country?

## Comparative Advantage and Opportunity Cost (cont.)

- Ecuador has a lower opportunity cost of producing roses.
  - Ecuador can produce 10 million roses, compared to 30,000 computers that it could otherwise produce.
  - The US can produce 10 million roses, compared to 100,000 computers that it could otherwise produce.



## Comparative Advantage and Opportunity Cost (cont.)

- The US has a lower opportunity cost in producing computers.
  - Ecuador can produce 30,000 computers, compared to 10 million roses that it could otherwise produce.
  - The US can produce 100,000 computers, compared to 10 million roses that it could otherwise produce.
  - The US can produce 30,000 computers, compared to 3.3 million roses that it could otherwise produce.

## 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 computer production
  - uses its resources more efficiently in producing computers compared to other uses.
- Ecuador
  - has a comparative advantage in rose production
  - it uses its resources more efficiently in producing roses compared to other uses.
- Suppose **initially that Ecuador produces computers and the US produces roses,** and that both countries want to consume computers and roses.
- Can both countries be made better off?

## Comparative Advantage and Trade

| | Millions of Roses | Thousands of Computers |
|---|---|---|
| U.S. | -10 | +100 |
| Ecuador | +10 | -30 |
| Total | 0 | +70 |

The US gives up producing roses and only produce computers

Ecuador gives up producing computers and only produce roses

## Comparative Advantage and Trade (cont.)

- When countries specialize in production in which they have a comparative advantage,
  - more goods and services can be produced and consumed.
  - Initially, the world consumes10 million roses and 30 thousand computers.
  - After specialization: still consume 10 million roses, but could consume 70,000 more computers.

## A One Factor Ricardian Model



## Assumptions

1. Only two countries are modeled: domestic and foreign.
2. Only two goods are important for production and consumption: 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.
  - $a_{LW}$ : the unit labor requirement for wine in the domestic country.
    - $a_{LW}$ = 2???
  - $a_{LC}$ : the unit labor requirement for cheese in the domestic country.
    - $a_{LC}$ = 1???
  - A high unit labor requirement means low 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:

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

- $a_{LC}Q_C$: Labor required for each unit of cheese production; total units of cheese production
- $a_{LW}Q_W$: Labor required for each unit of wine production; total units of wine production
- $L$: Total amount of labor resources

## Production Possibilities (cont.)

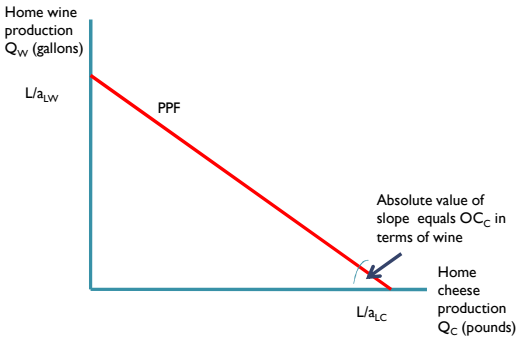
- Then the production possibility frontier of the domestic economy has the equation:

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

- $a_{LC}Q_C$: Labor required for each unit of cheese production; total units of cheese production
- $a_{LW}Q_W$: Labor required for each unit of wine production; total units of wine production
- $L$: Total amount of labor resources

- $Q_W = L/a_{LW} - (a_{LC}/a_{LW})Q_C$

## Production Possibilities (cont.)




## Production Possibilities (cont.)

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

- $Q_C = L/a_{LC}$ when $Q_W = 0$
- $Q_W = L/a_{LW}$ when $Q_C = 0$
- $Q_W = L/a_{LW} - (a_{LC}/a_{LW})Q_C$: the equation for the PPF, with a slope equal to $-(a_{LC}/a_{LW})$
- When the economy uses all of its resources, the opportunity cost of cheese production is the quantity of wine that is given up (reduced) as $Q_C$ increases: $(a_{LC}/a_{LW})$
- When the economy uses all of its resources, the opportunity cost is equal to the absolute value of the slope of the PPF, and it is constant when the PPF is a straight line.

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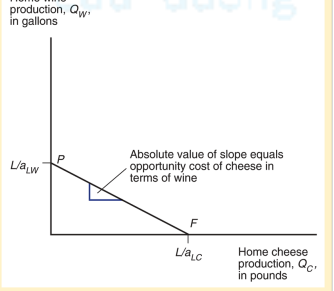
## Production Possibilities (cont.)

**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.

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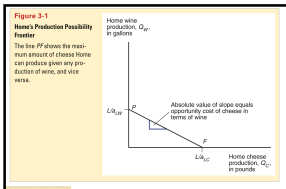
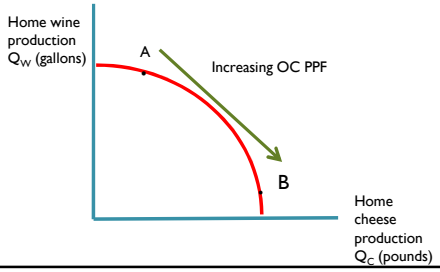



When there is only one factor of production, PPF is simply an straight line.

Constant OC
No scale economics




## 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.**

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## A numerical example

| | Cheese | Wine |
|---|---|---|
| Home | $a_{LC}$ = 1hour/kg | $a_{LW}$ = 2hours/l |
| Foreign | $a_{LC}^*$ = 6 hours/kg | $a_{LW}^*$ = 3 hours/kg |

- Develop PPF of Home and Foreign.
- Sketch PPF of each nation
- What is its opportunity cost of producing wine in Chinese? what is its opportunity cost of producing cheese in Chinese?
- Which country has an absolute advantage in wine? Cheese?
- Which country has a comparative advantage in cheese production?

PRODUCTION, PRICE AND WAGES

## Hourly Wages

- $P_C$ : the price of cheese
- $P_W$: the price of wine.
- Because of competition:
  - Hourly wages of workers = market value of products they can produce in one hour
  - Market value of products produced in one hour = $P/a_L$
  - hourly wages of cheese makers are equal to the market value of the cheese produced in an hour: $P_c/a_{LC}$
  - hourly wages 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.

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## Production and Prices (cont.)

- If $P_C/a_{LC} > P_W/a_{LW}$ => Which product will be produced?
  - workers will make only cheese.
  - If $P_C/P_W > a_{LC}/a_{LW}$ => Which product will be produced?
  - 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.**

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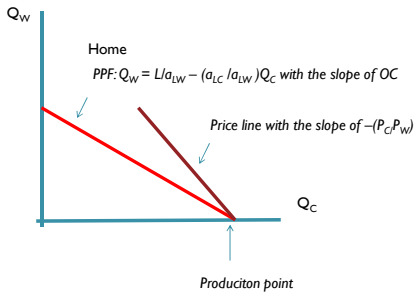
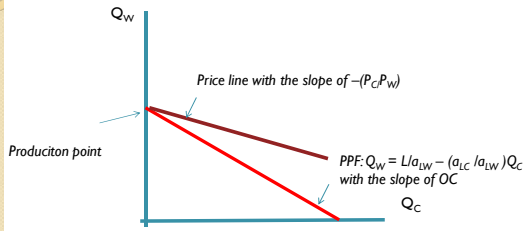



## Production and Prices (cont.)

- If $P_C/a_{LC} < P_W/a_{LW}$ => which product be specialized?
  - workers will make only wine.
- If $P_C/P_W < a_{LC}/a_{LW}$ => which product be specialized?
  - workers will only make wine.
- If $P_W/P_C > a_{LW}/a_{LC}$ 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.**

- 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 naiton 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),
  - What are wages in wine and cheese industry? Which is higher?

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## Wages in autarky (cont.)

- If wage in cheese industry is higher than that in wine industry
- $P_C/a_{LC} > P_W/a_{LW}$

$\Rightarrow P_C/P_W > a_{LC}/a_{LW}$ *(relative price of cheese is higher than OC of producing cheese)*

- The country will specialize in cheese production.

$\Rightarrow$ the naiton can not satisfy customers' demand of both goods

## Wages in autarky (cont.)

- If wage in cheese industry is lower than that in wine industry
- $P_C/a_{LC} < P_W/a_{LW}$

$\Rightarrow P_C/P_W < a_{LC}/a_{LW}$ *(relative price of cheese is lower than OC of producing cheese)*

- The country will specialize in wine production.

$\Rightarrow$ the naiton can not satisfy customers' demand of both goods

## Wages in autarky (cont.)

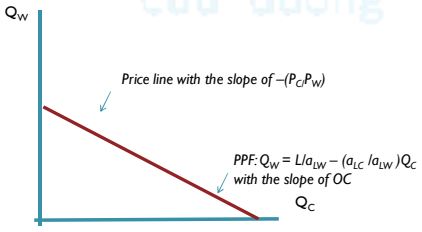
- If wage in cheese industry is equal to that in wine industry
- $P_C/a_{LC} = P_W/a_{LW}$

$\Rightarrow P_C/P_W = a_{LC}/a_{LW}$ *(relative price of cheese is lower than OC 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.

$\Rightarrow$ 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.**

$\Rightarrow$ In other goods, 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 THE RICARDIAN 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



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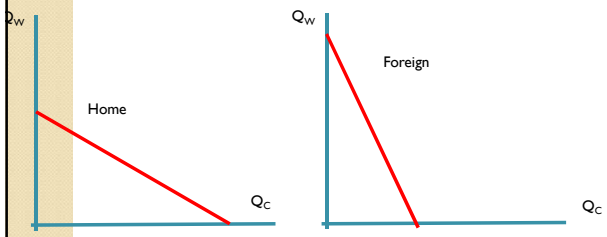
## PPF of two nations




## Benefit from trade under comparative advantage

- Suppose the domestic country has an *absolute advantage* in production of both wine and cheese
  - $a_{LC} < a^*_{LC}$ and $a_{LW} < a^*_{LW}$
- A country can be more efficient in producing both goods, but it will have a comparative advantage in only one good—the good that uses resources most efficiently compared to alternative production.
- Even if a country is the most (or least) efficient producer of all goods, it still can benefit from trade.

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## Trade in the Ricardian Model (cont.)

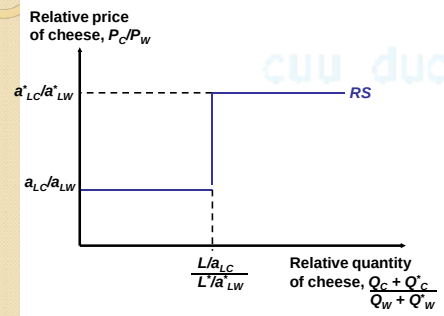
- To see how all countries can benefit from trade, we calculate relative prices when trade exists.
  - Without trade, relative price of a good equals the opportunity cost of producing that good.
- To calculate relative prices with trade, we must
  - Calculate relative supply
  - Calculate relative demand.
  - Then, find the intersection between these two.

## Relative Supply

- **Relative supply** of cheese: the quantity of cheese supplied by all countries relative to the quantity of wine supplied by all countries at each relative price of cheese, $P_C/P_W$.

$$(Q_C + Q^*_C)/(Q_W + Q^*_W)$$

## Relative Supply (cont.)



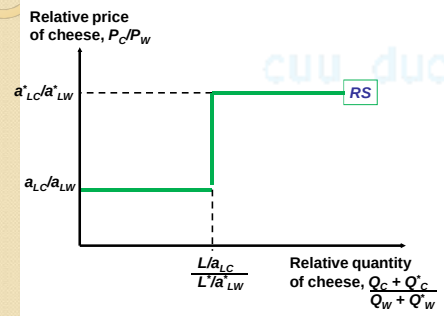

## Relative Supply and Relative Demand (cont.)

- *When* $P_C/P_W < a_{LC}/a_{LW} < a_{LC}^*/a_{LW}^*$ => There is no supply of cheese.
  - Why? because 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 $L/a_{LC}/L^*/a^*_{LW}$

## Relative Supply and Relative Demand (cont.)

- When $a^*_{LC}/a^*_{LW} > P_c/P_W > a_{LC}/a_{LW}$,
  - Home specializes in cheese production because they can earn higher wages
  - Foreign workers will still produce only wine.
  - Relative supply of cheese is equal to $\boldsymbol{L/a_{LC}/L^*/a^*_{LW}}$
- When $a^*_{LC}/a^*_{LW} = P_C/P_W$,
  - Foreign will be indifferent between producing wine or cheese
  - Home will still produce only cheese.
- There is no supply of wine if the relative price of cheese rises above $a^*_{LC}/a^*_{LW}$

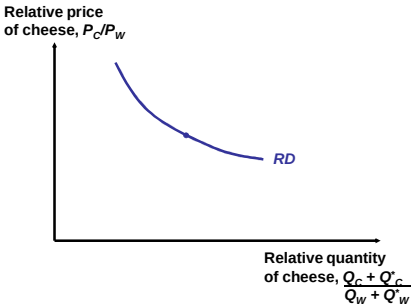
## Relative Supply (cont.)




## Relative Demand

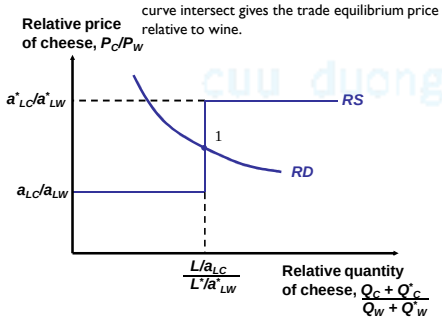
- Relative demand of cheese is the quantity of cheese demanded in all countries relative to the quantity of wine demanded in all countries at each relative price of cheese, $P_C/P_W$.
- As the relative price of cheese rises
  - Consumers in all countries will tend to purchase less cheese and more wine
  - The relative quantity of cheese demanded falls.

## Relative Demand (cont.)

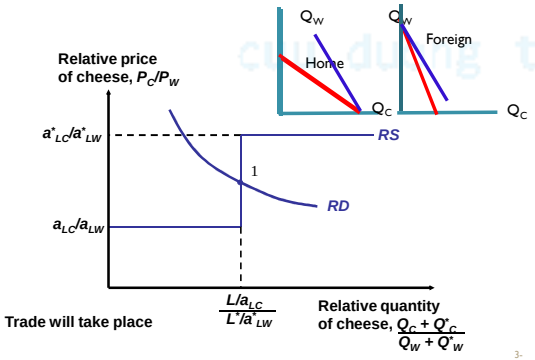



## Relative Supply and Relative Demand

Where the relative demand curve and the relative supply curve intersect gives the trade equilibrium price of cheese relative to wine.




## Relative Supply and Relative Demand (cont.)




Trade will take place

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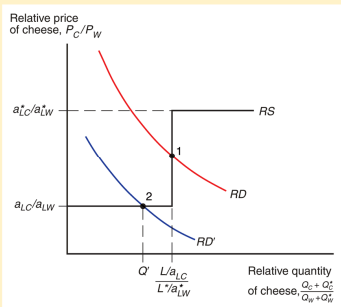
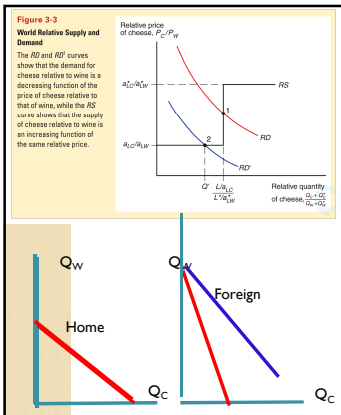
## Relative Supply and Relative Demand (cont.)

**Figure 3-3**
**World Relative Supply and Demand**
The *RD* and *RD'* curves show that the demand for cheese relative to wine is a decreasing function of the price of cheese relative to that of wine, while the *RS* curve shows that the supply of cheese relative to wine is an increasing function of the same relative price.







At point 2, Foreign completely specialize in wine production. Home does not specialize
=> trade will not take place because Home is not willing to participate in trade.

## Note

- Relative supply curve
- Relative demand curve
- Relative prices
- Conditions for trade to take place: international relative price must lie between two internal (domestic relative prices)

GAINS FROM TRADE

## Gains From Trade

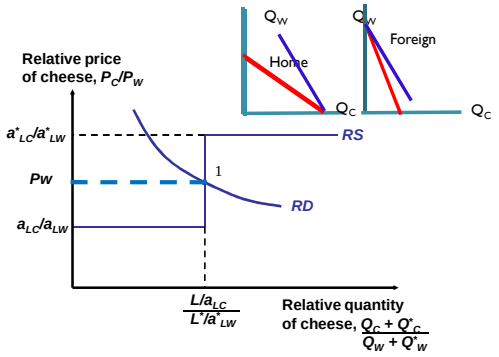
- Gains from trade come from
  - specializing in production that use resources most efficiently (means producing a good in which a country has a comparative advantage).
  - using the income generated from that production to buy the goods and services that countries desire.

⇒Trade: an indirect method of production (converts 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.

## Relative Supply and Relative Demand (cont.)




## 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.)

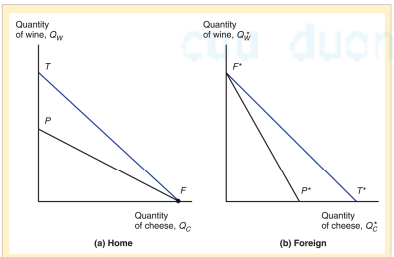



**Figure 3-4**
**Trade Expands Consumption Possibilities**
International trade allows Home and Foreign to consume anywhere within the colored lines, which lie outside the countries' production possibility frontiers.

## 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 (technological) 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
- Identify relative wages of each nation?

## 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
  $(1/a_{LC})P_C = (1/1)\$12 = \$12$
- After trade, foreign workers specialize in wine production, their hourly wages will be
  $(1/a^*_{LW})P_W = (1/3)\$12 = \$4$
- 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.)

The relative wage of domestic workers is $12/$4 = 3

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

The cost of high wage can be offset by high productivity

## Relative Wages (cont.)

The relative wage of domestic workers is $12/$4 = 3

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

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

## Relative Wages (cont.)

- These relationships imply that both countries have a *cost advantage in production.*
  - The cost of high wages can be offset by high productivity.
  - The cost of low productivity can be offset by low wages.

## Do Wages Reflect Productivity?

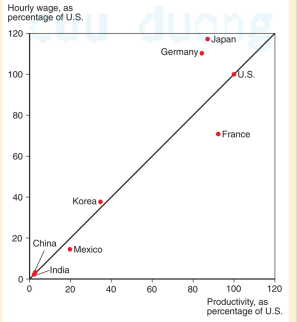
- In the Ricardian model, relative wages reflect relative productivities of the two countries.
- Is this an accurate assumption?
- Some argue that low wage countries pay low wages despite growing productivity, putting high wage countries at a cost disadvantage.
- But evidence shows that low wages are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

- The Ricardian one factor model: the simplest of all models of international trade.

=> good way to deal with several misconceptions about the meaning of comparative advantage.

- These misconceptions: are very frequent
  - in public debate about international economic policy
  - in statements by those who regard themselves as experts.

=> discuss some of the most common misunderstandings 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 (cont.)

2. Free trade with countries that pay low wages hurts high wage countries.
   - Pauper Labor Argument => favorable to labor unions seeking protection form 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 (cont.)

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

- 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

- 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 $wa_{LI} < w^* a^*_{LI}$
  - then only Home will produce good 1, since total wage payments are less there.
- Or equivalently, if $a^*_{LI} / a_{LI} > w/w^*$

  Relative productivity of Home in producing good 1 | Relative wage of Home

  - 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 $a^*_{LI} / a_{LI} < w/w^*$
  - 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 $w/w^* = 3$, which products are produced by Home?

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.

## Comparative Advantage With Many Goods (cont.)

- How is the relative wage determined in the multi good model?
- How is the relative wage in the two good model determined?
- By the relative supply and relative (derived) demand for labor.
  - Relative supply of labor: the world supply of Home labor relative to Foreign labor
  - Relative demand for labor: the world demand for Home labor relative to Foreign labor
  - Derived demand for labor is resulted from the demand for goods produced with each country's labor.

## Comparative Advantage With Many Goods (cont.)

- How to construct the relative derived demand curve for Home?
- The relative (derived) demand for Home labor will fall when $w/w^*$ rises for two reasons:
  - Home labor becomes more expensive relative to foreign labor,
  - Goods produced in Home become more expensive, and demand for these goods and then the labor to produce them falls.

(fewer goods will be produced in the domestic country, further reducing the demand for domestic labor.).

## Comparative Advantage With Many Goods (cont.)

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 ($a^*_{Li}/a_{Li}$) |
|---|---|---|---|
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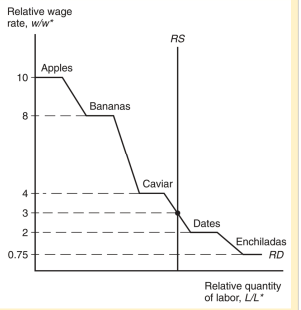
| Bananas | 5 | 40 | 8 |
| Caviar | 3 | 12 | 4 |
| Dates | 6 | 12 | 2 |
| Enchiladas | 12 | 9 | 0.75 |

- Suppose $w/w^*$ increases from 3 to 3.99: how demand for labor in Home change?
  - The domestic country would produce apples, bananas, and caviar, but the demand for these goods and the labor to produce them falls as the relative wage rises.
- Suppose $w/w^*$ increases from 3.99 to 4.01:
  - Caviar is now too expensive to produce in the domestic country, so the caviar industry moves to the foreign country, causing a discrete (abrupt) drop in the demand for domestic labor.
- Consider similar effects as $w/w^*$ rises from 0.75 to 10.

## Comparative Advantage With Many Goods (cont.)

**Figure 3-5**
**Determination of Relative Wages**
In a many-good Ricardian model, relative wages are determined by the intersection of the derived relative demand curve for labor *RD* with the relative supply *RS*.

The equilibrium wage rate is 3. At this stage, Home produces apples, bananas and caviar while Foreign produces Dates and Enchiladas.




## Comparative advantage with more than two nations

Ranking of Nation in terms of Internal Pw/Pc

| Nation | A | B | C | D | E |
|---|---|---|---|---|---|
| Pw/Pc | 1 | 2 | 3 | 4 | 5 |

- If the equilibrium Pw/Pc = 3 with trade, what happens?
  - Nation A and B will export wine to nation D and E in exchange for cheese.
  - Nation C will not engage in trade because internal (pre-trade) Pw/Pc is equal to equilibrium price with trade.

## Comparative advantage with more than two nations (cont.)

Ranking of Nation in terms of Internal Pw/Pc

| Nation | A | B | C | D | E |
|---|---|---|---|---|---|
| Pw/Pc | 1 | 2 | 3 | 4 | 5 |

- If the equilibrium Pw/Pc = 4 with trade
  - Nation A, B and C will export wine to nation E in exchange for cheese.
  - Nation D will not engage in trade because internal (pre-trade) Pw/Pc is equal to equilibrium price with trade.

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)

## Empirical Evidence

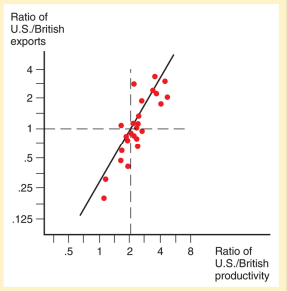
- Do countries export those goods in which their productivity is relatively high?
- The ratio of US to British exports in 1951 compared to the ratio of US to British labor productivity in 26 manufacturing industries suggests: YES.
- At this time the US had an absolute advantage in *all* 26 industries, yet the ratio of exports was low in the least productive sectors of the US.

## Empirical Evidence (cont.)

**Figure 3-6**

**Productivity and Exports**

A comparative study showed that U.S. exports were high relative to British exports in industries in which the United States had high relative labor productivity. Each dot represents a different industry.




## 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.

3-95

## Summary (cont.)

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.
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.

## Summary (cont.)

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

## Next week

- A quiz (10 questions)
- Chapter 3



END OF CHAPTER 3