



Chapter 2

Labor Productivity and Comparative Advantage: The Ricardian Model



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To Accompany
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by **Paul R. Krugman and Maurice Obstfeld**


Chapter Organization



- Introduction
- The Concept of Comparative Advantage
- A One-Factor Economy
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Introduction



- Countries engage in international trade for two basic reasons:
 - They are different from each other in terms of climate, land, capital, labor, and technology.
 - They try to achieve scale economies in production.
- The **Ricardian model** is based on technological differences across countries.
 - These technological differences are reflected in differences in the productivity of labor.

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The Concept of Comparative Advantage



- On Valentine's Day the U.S. demand for roses is about 10 million roses.
- Growing roses in the U.S. in the winter is difficult.
 - Heated greenhouses should be used.
 - The costs for energy, capital, and labor are substantial.
- Resources for the production of roses could be used to produce other goods, say computers.

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The Concept of Comparative Advantage



- **Opportunity Cost**
 - The opportunity cost of roses in terms of computers is the number of computers that could be produced with the same resources as a given number of roses.
- **Comparative Advantage**
 - A country has a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries.

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The Concept of Comparative Advantage



- **The principle of comparative advantage:**
 - If each country exports the goods in which it has comparative advantage (lower opportunity costs), then all countries can in principle gain from trade.
- **What determines comparative advantage?**
 - Answering this question would help us understand how country differences determine the pattern of trade (which goods a country exports).

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A One-Factor Economy

- Assume that we are dealing with an economy (which we call Home). In this economy:
 - Labor is the only factor of production.
 - Only two goods (say wine and cheese) are produced.
 - The supply of labor is fixed in each country.
 - The productivity of labor in each good is fixed.
 - Perfect competition prevails in all markets.

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A One-Factor Economy

- The constant labor productivity is modeled with the specification of unit labor requirements:
 - The **unit labor requirement** is the number of hours of labor required to produce one unit of output.
 - Denote with a_{LW} the unit labor requirement for wine (e.g. if $a_{LW} = 2$, then one needs 2 hours of labor to produce one gallon of wine).
 - Denote with a_{LC} the unit labor requirement for cheese (e.g. if $a_{LC} = 1$, then one needs 1 hour of labor to produce a pound of cheese).
- The economy's total resources are defined as L , the total labor supply (e.g. if $L = 120$, then this economy is endowed with 120 hours of labor or 120 workers).

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A One-Factor Economy

- **Production Possibilities**
 - The **production possibility frontier** (PPF) of an economy shows the maximum amount of a good (say wine) that can be produced for any given amount of another (say cheese), and vice versa.
 - The PPF of our economy is given by the following equation:

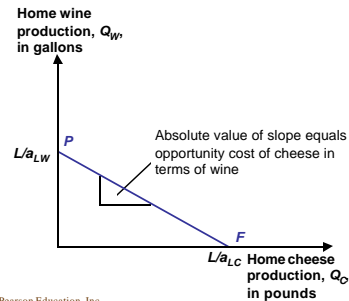
$$a_{LC}Q_C + a_{LW}Q_W = L \quad (2-1)$$

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A One-Factor Economy

Figure 2-1: Home's Production Possibility Frontier



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A One-Factor Economy

- **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).
 - Examples of relative prices:
 - If a price of a can of Coke is \$0.5, and the price of a chocolate bar is \$1, then the relative price of Coke is the amount of chocolate bars that can be exchanged for one unit of Coke, which is 0.5.
 - The relative price of a chocolate bar in terms of Coke is 2 cans of Coke per bar.

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A One-Factor Economy

- Denote with P_C the dollar price of cheese and with P_W the dollar price of wine. Denote with w_W the dollar wage in the wine industry and with w_C the dollar wage in the cheese industry.
- Then under perfect competition, the non-negative profit condition implies:
 - If $P_W / a_W < w_W$, then there is no production of Q_W .
 - If $P_W / a_W = w_W$, then there is production of Q_W .
 - If $P_C / a_C < w_C$, then there is no production of Q_C .
 - If $P_C / a_C = w_C$, then there is production of Q_C .

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A One-Factor Economy

- The above relations imply that if the relative price of cheese (P_C / P_W) exceeds its opportunity cost (a_{LC} / a_{LW}), then the economy will specialize in the production of cheese.
- In the absence of trade, both goods are produced, and therefore $P_C / P_W = a_{LC} / a_{LW}$.

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Trade in a One-Factor World

- Assumptions of the model:
 - There are two countries in the world (Home and Foreign).
 - Each of the two countries produces two goods (say wine and cheese).
 - Labor is the only factor of production.
 - The supply of labor is fixed in each country.
 - The productivity of labor in each good is fixed.
 - Labor is not mobile across the two countries.
 - Perfect competition prevails in all markets.
 - All variables with an asterisk refer to the Foreign country.

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Trade in a One-Factor World

- **Absolute Advantage**
 - A country has an **absolute advantage** in a production of a good if it has a lower unit labor requirement than the foreign country in this good.
 - Assume that $a_{LC} < a_{LC}^*$ and $a_{LW} < a_{LW}^*$
 - This assumption implies that Home has an absolute advantage in the production of both goods. Another way to see this is to notice that Home is more productive in the production of both goods than Foreign.
 - Even if Home has an absolute advantage in both goods, beneficial trade is possible.
- The pattern of trade will be determined by the concept of comparative advantage.

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Trade in a One-Factor World

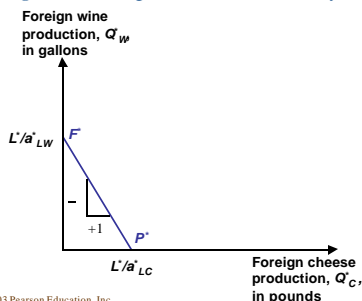
- **Comparative Advantage**
 - Assume that $a_{LC} / a_{LW} < a_{LC}^* / a_{LW}^*$ (2-2)
 - This assumption implies that the opportunity cost of cheese in terms of wine is lower in Home than it is in Foreign.
 - In other words, in the absence of trade, the relative price of cheese at Home is lower than the relative price of cheese at Foreign.
- Home has a comparative advantage in cheese and will export it to Foreign in exchange for wine.

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Trade in a One-Factor World

Figure 2-2: Foreign's Production Possibility Frontier



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Trade in a One-Factor World

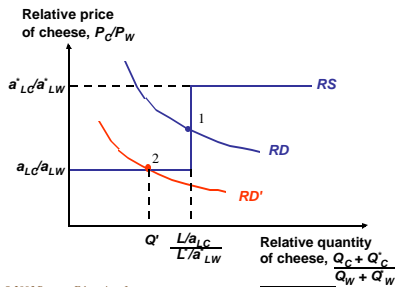
- **Determining the Relative Price After Trade**
 - What determines the relative price (e.g., P_C / P_W) after trade?
 - To answer this question we have to define the relative supply and relative demand for cheese in the world as a whole.
 - The **relative supply** of cheese equals the total quantity of cheese supplied by both countries at each given relative price divided by the total quantity of wine supplied, $(Q_C + Q_C^*) / (Q_W + Q_W^*)$.
 - The **relative demand** of cheese in the world is a similar concept.

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Trade in a One-Factor World

Figure 2-3: World Relative Supply and Demand



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Trade in a One-Factor World

The Gains from Trade

- If countries specialize according to their comparative advantage, they all gain from this specialization and trade.
- We will demonstrate these gains from trade in two ways.
- First, we can think of trade as a new way of producing goods and services (that is, a new technology).

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Trade in a One-Factor World

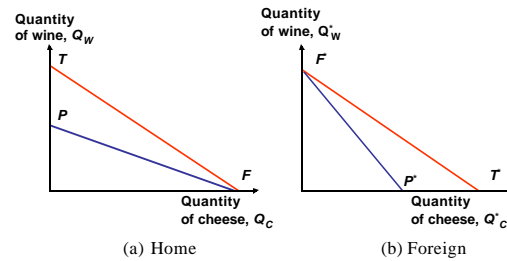
- Another way to see the gains from trade is to consider how trade affects the consumption in each of the two countries.
- The consumption possibility frontier states the maximum amount of consumption of a good a country can obtain for any given amount of the other commodity.
- In the absence of trade, the consumption possibility curve is the same as the production possibility curve.
- Trade enlarges the consumption possibility for each of the two countries.

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Trade in a One-Factor World

Figure 2-4: Trade Expands Consumption Possibilities



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Trade in a One-Factor World

Relative Wages

- Because there are technological differences between the two countries, trade in goods does not make the wages equal across the two countries.
- A country with absolute advantage in both goods will enjoy a higher wage after trade.

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Misconceptions About Comparative Advantage

Productivity and Competitiveness

- Myth 1: Free trade is beneficial only if a country is strong enough to withstand foreign competition.
 - This argument fails to recognize that trade is based on comparative not absolute advantage.

The Pauper Labor Argument

- Myth 2: Foreign competition is unfair and hurts other countries when it is based on low wages.
 - Again in our example Foreign has lower wages but still benefits from trade.

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Misconceptions About Comparative Advantage

Exploitation

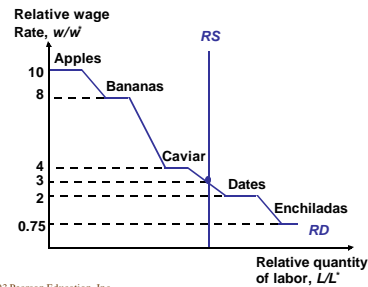
- Myth 3: Trade makes the workers worse off in countries with lower wages.
 - In the absence of trade these workers would be worse off.
 - Denying the opportunity to export is to condemn poor people to continue to be poor.

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Comparative Advantage with Many Goods

Figure 2-5: Determination of Relative Wages

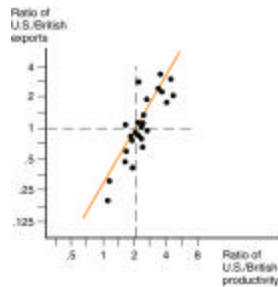


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Empirical Evidence on the Ricardian Model

Figure 2-6: Productivity and Exports



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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, labor 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) labor productivity advantage.

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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.

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Summary

- 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.
- 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.

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