

Absolute and Comparative Advantage: Ricardian Model

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1 Absolute and Comparative Advantage

1.1 Adam Smith's Theory of Absolute Advantage

The trade theory that first indicated importance of specialization in production and division of labor is based on the idea of *theory of absolute advantage* which is developed first by Adam Smith in his famous book *The Wealth of Nations* published in 1776. Later on David Ricardo in his book titled *On the Principles of Political Economy* published in 1819 extended it to incorporate theory of comparative advantage and showed that it is the basis why nations need to trade and why trade is mutually beneficial to countries. Before going into the details of the Adam Smith's and Ricardo's models it is good idea to illus-

trate the idea in an informal way.

Consider the following situation of a physician and a secretary. Clearly the physician has both absolute and comparative advantage in terms of performing surgery. However, also suppose the physician is a better organizer, typist and administrator than secretary. Hence the physician has an absolute advantage over the secretary in terms of both surgery and secretarial services.

There is no way the secretary could perform the physician's job. Hence, the physician is comparatively better in performing surgery than secretary. On the other hand, secretary is comparatively better at performing secretarial job.

Absolute Advantage: If a country or individual absolutely more efficient at production of a good than another country or individual, then we say that

she has absolute advantage in the production of that good.

Comparative Advantage If a country or individual is relatively more efficient in the production of a good than another country or individual then we say that she has comparative advantage in production of that good.

Comparative advantage measures efficiency in terms of relative magnitudes. Since countries have limited resources and level of technology they tend to produce goods or services in which they have a comparative advantage. Comparative advantage (from now on CA) implies an opportunity cost associated with the production of one good compared to another. That is why countries tend to specialize in production of certain products. This notion is called international division of labor.

2 Smith's Model

Assumptions In addition to A1-A7 we have made so far suppose the following conditions hold.

- A8. Factors of production can not move between countries. This assumption excludes the possibility of migration between countries, as well as presence of multinational companies. It also implies that the PPF of each country will not change after the trade and there is no reason to expect wages (measured in the same currency) be the same after trade.
- A9. No barriers to trade in goods.
- A10. Exports must be equal to imports. This assumption means that we exclude trade imbalances, trade deficits or surpluses.
- A11. Labor is the only relevant factor of produc-

tion.

- A12. Production exhibits constant returns to scale.

Constant Returns to Scale (CRS) means that the technological relationship between inputs and output is characterized by constant returns in the sense that proportionate changes in *all* inputs lead to proportionate changes in output. For example, if it takes 2 hours to make 1 pound of cheese in country A, then it should take 4 hours to produce 2 pounds of cheese, and 8 hours to produce 4 pounds of C,... etc. To illustrate the idea of absolute advantage (AA) consider the following table which gives the labor hours required to produce one unit of C and W in our hypothetical countries A and B.

	A	B
Cheese	2	10
Wine	8	4

A has AA in production of C as it takes fewer hours to produce a unit of C in A than in B. Since it takes less hours in B to produce W, B has an AA in production of W.

Adam Smith's theory: Countries should specialize in the production of goods in which they have an AA. So A will be better if it specializes in the production of C and B will be better if it specializes in W. So they don't need to produce both goods at home.

What happens if A and B follow Smith's theory? Suppose the output of W is reduced by one unit in A and output of C is reduced one unit in B.

Per unit gains from specialization when A specializes in C and B in W:

	In Production of C	In Production of W
In A	+4	-1
In B	-1	+2.5
In World	+3	+1.5

But how workers are persuaded in each country to behave along the lines of AA? The answer is Adam Smith's "invisible hand" idea! Free market forces, supply and demand will ensure that this will happen. How exactly?

Labor theory of value (classical economists believed the relevance of this theory, like Adam Smith, Ricardo, Karl Marx etc) indicates that pretrade prices of goods are determined by their labor content. Given our assumption of perfect competition in each indus-

try (A5) the price of a good in autarky is simply the cost of the labor inputs used in its production, that is;

$$P_C = W_A * L_{C,A} = W_A * 2$$

$$P_W = W_A * L_{W,A} = W_A * 8$$

Therefore, relative price ratio will be

$$\left(\frac{P_C}{P_W}\right)_A = \frac{W_A * 2}{W_A * 8} = 2/8 = 1/4$$

Similarly,

$$\left(\frac{P_C}{P_W}\right)_B = \frac{W_B * 10}{W_B * 4} = 10/4 = 2.5$$

Q. What is the implication of these relative prices?

A. In autarky, C costs 1/4 units of W in A (in value) but 2.5 units of W in B.

Q. What happens if trade allowed in this model?

If you were living in B, and want to have some C for consumption from where you want to buy the C? A or B? Why?

Demand for A's C will rise. Country A's autarky price of W is 4 pounds of C, while B's price is only $1/2.5=2/5$ pounds. Hence with trade, consumers in A would like to buy W from country B's producers as they produce cheaper and thus sell less. Since the domestic demand for W in A will fall causing layoffs in W industry in country A. Since labor can move freely between industries in each country, they will get jobs in C industry, increasing the production of C in A. A similar process occurs in B in that where rising demand for W will cause expansion of Wine industry and shrinkage of C industry. Hence, in equilibrium, A will specialize in the production of C and B in W.

3 Ricardo's Model

Adam Smith's theory says that countries will be better off in specializing the good at which they have AA. But what happens if one of the countries has AA in production of both goods? Should they abandon trade?

Consider the following example:

	A	B
Cheese	6	12
Wine	2	18

In this example, A has AA in production of both C and W. The answer to above question comes from David Ricardo's theory of comparative advantage which says that a has a CA in a good if the good has a lower relative price in autarky than is found in the other country. This theory indicates that we need to look at

the cost of product in each country before the trade (in autarky) and compare it with trade situation and compute gains/losses from trade. That way we can better understand the pattern of trade between two countries, and be able to answer questions like why does it makes sense for a country to export say cheese and import wine or vice versa. In the example above, A is 2 (12/6) times more efficient in production of C than B, while 9 times more efficient in production of W. Thus A has more AA in production of W compared to C. So, if trade takes place A will tend to produce more W as W is *relatively* cheaper in A than in B. What about B? According to theory of comparative advantage B should expand its production of C as the cheese production in B is relatively less costly. How do we know this? We compare autarky relative prices. What is the relative price of W

in autarky in A and B?

$$\left(\frac{P_W}{P_C}\right)_A = \frac{W_A * 2}{W_A * 6} = 1/3 = 0.33$$

Similarly, the relative price of W in B is:

$$\left(\frac{P_W}{P_C}\right)_B = \frac{W_B * 18}{W_B * 12} = 3/2 = 1.5$$

So in autarky, W is cheaper in A than in B. Taking the reciprocals of above relative prices we find the relative price of C in terms of W in A and B respectively. As you can easily verify, C is cheaper in B than in A. Recall that along PPF of each country relative price gives the opportunity cost. Hence, in autarky, opportunity cost of W in A is lower than that in B, indicating that A's producers are relatively more efficient in W rather than in C. The opposite holds true for B's producers. According the law of comparative advantage once trade allowed between the two countries, A should specialize in W and B in C. For illustration of the outcome in terms of world output

of W and C, suppose that A produces 1 less unit of C and B 1 less unit of W. The result is shown in the following table.

Per unit gain		
	in prod. of C	in prod. of W
in A	-1	+3
in B	+1.5	-1
in world	+0.5	+2

4 General Equilibrium of Ricardian Model

To study the general equilibrium solution of Ricardo's model we suppose that the assumptions A1-A12 holds. Also, assume that the labor endowments are, $L_A = 3,000$ hours and $L_B = 5,400$ hours. Draw the PPF in each country.

Q. What will be the shape of PPF?

PPFs:

4.1 Autarky Equilibrium

In autarky competitive behavior will lead to the general equilibrium solutions be along each country's PPF. Graphically:

4.2 Trade Equilibrium

So far we know that pre-trade price of W is lower in A than in B while the pre-trade price of C is lower in B than in A.

Q. Can these price differentials exist if two countries trade with each other?

A. No. With free trade, demand for W will rise in A and fall in B. Hence, the relative price of W will begin to rise in A and fall in B. Similarly, demand for C will fall in A and rise in B while the relative price of C (P_C/P_W) will fall in A and rise in B. This process will continue until a new equilibrium is reached in which there is no excess demand or supply for any of the goods. This new equilibrium is the *international trade equilibrium*.

In the trade equilibrium, the price that clears world markets for a particular product is called the *terms of trade*. It is the price at which exchange of W and C will take place in our hypothetical two-country, two-good world. The range of terms of trade of trade for W (relative price of W in trade equilibrium) will be (0.33, 1.5).

Q. Why the relative price with trade can't be outside this range?

A.

In order to better understand the nature of trade equilibrium suppose that the terms of trade is 1. That is $(\frac{P_W}{P_C})_w = 1$. What would happen in at this terms of trade (TOT)?

The after trade relative price of W is higher than the autarky price in A and lower than the autarky price in B. At this new price, producers in A can sell (to consumers from both A and B) one bottle of W in exchange of 1 pound of C instead of exchanging it with 1/3 pounds of C. A's producers will expand their W production, while B's producers shrink it and expand their C production as they can exchange 1 pound of C by 1 bottle of W (instead of 2/3 bottles of W). A's C producers will observe that relative price of C becomes lower than 3 and hence cut the production of C. Similarly, B's producers of W cut their W production. This process will end eventu-

ally whenever no excess demand or supply left out in both industries. Given the assumption of COCs, this process will end when A specializes completely in production of W and B in production of C.

Result: Under assumptions A1-A12, free international trade leads each country to specialize completely in the production of its comparative-advantage good. The production of lower autarky price good expands, hence trade follows the law of comparative advantage.

Graphically this process can be illustrated as follows:

Consumption Possibility Frontier (CPF):

The TOT line also represents CPF in the sense that it gives the various combinations of goods a country can obtain by engaging in international trade.

Trade Triangle A country's trade triangle illustrates how much the residents of a country wants to trade at a given world price. Its sides tell us how the desired exports and imports for a given TOT which in turn determined by the absolute value of the slope of the hypotenuse of the triangle.

Walras Law If there are n markets and $n-1$ of them are in equilibrium then the n -th one should be in equilibrium as well.

This law indicates that the market forces will bring the n -th market into equilibrium. In international economics the process through which the demand and supply interacts and obtains equilibrium is known as *reciprocal demand*.

5 An alternative way of illustrating international trade equilibrium

6 Gains from trade

The gains from trade can be illustrated in two ways. One way is to compare the consumption levels in autarky and in trade. As shown in the following graph country A's trade consumption level is higher than in autarky as the CIC_1 lies above CIC_0 . In autarky produce and consume at 'a' but in trade specialize in W and produce at 'b' and for each bottle of one sold receive 1 ounds of C rather than 1/3 pounds. This way increase the level of consumption of both goods by consuming at c.

Another way is to look at real GDP levels in autarky and in trade. $GDP = P_C * C + P_W * W$ is the nominal GDP. Divide both sides by P_W to get real GDP. $GDP/P_W = (P_C/P_W) * C + W$. Graphically gains then:

7 Wages and trade

What is the relationship between international trade and payments to factors of production? In the Ricardian model we have assumed that labor is the only factors of production. So we need to understand the relationship between wages and the trade? Recall that we have also assumed that perfect competition in product and factor markets. Hence in autarky following equations should hold:

$$P_{C,A} = W_A * L_{C,A} = W_A * 6$$

$$P_{W,A} = W_A * L_{W,A} = W_A * 2$$

$$P_{C,B} = W_B * L_{C,B} = W_B * 12$$

$$P_{W,B} = W_B * L_{W,B} = W_B * 18$$

All prices and wages are expressed in local cur-

rency. For trade to occur along the lines of comparative advantage it must be that when measured in the *same currency*, the pretrade money price of a country's comparative advantage good is less than or equal to the pretrade money price of that good in the other country. Suppose this holds true for both W and C. That is both W and C are cheaper in one country in the autarky. Then following conditions must hold:

$$P_{W,A} < S * P_{W,B}$$

and

$$P_{C,A} > S * P_{C,B}$$

where S stands for the exchange rate that translates units of B's currency into units of A's. (ex. A is US and B is Germany, then $S = \$0.5$ implies that 0.5 US dollars buys 1 GM or 1 dollar buys 2 GM). By using the equations above, the inequalities can be written

as;

$$W_A * 2 < S * W_B * 18$$

and

$$W_A * 6 > S * W_B * 12$$

Solving these system of inequalities and combining them;

$$2 < \frac{W_A}{S * W_B} < 9$$

The relative wage ratio is $\frac{W_A}{S * W_B}$. The inequality above indicates that the wage rate in country A divided by the wage rate in B and expressed in the same currency, in this example in A's currency, need to be between 2 and 9. In other words, for trade to occur along the lines of comparative advantage, workers in A must earn no less than 2 times the workers in B and no more than 9 times the workers in B. What does that mean? This means that there is

differences between the productivity of country A's and B's workers. As you can recall from the table, A's workers are more productive than B's in both industries. Thus A's workers should earn higher wages than B's.

8 Three claims on international trade

- 1. Free trade is beneficial only if your country is productive enough to stand up in international competition.
- 2. Foreign competition based on low wages is unfair and hurts the domestic economy.
- 3. If the one of the countries' say home country, uses more labor to produce exports than what the foreign country use to produce the same good, domestic workers are being exploited. Home labor works hard and gets little in return.

What does Ricardian model say about these claims

- 1. False. We saw there were gains to trade for both countries even though in our example B was less productive than A in absolute sense.
- 2. False. Wages are low because labor productivity is low. Wages will be lower for B's workers as the productivity of B's workers is low.
- 3. False. A specializes in W and B in C. We have seen that for each unit of W produced and sold in international markets A is able to get more C and similarly for each unit of C produced and sold in international markets B gets more units of W compared to autarky.