International Economics

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The Theory of Comparative Advantage

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Today's Plan

- David Ricardo
- Theory of comparative advantage
- Gains from trade
- Empirical evidence
- Common misconceptions
- Applications

Biography of David Ricardo

- British; Son of orthodox Jewish immigrants; 3rd of 17 children; converted to Christianity at marriage.
- Became wealthy as stockbroker; retired as country gentleman in his 40s, left a large inheritance (partly to **Malthus**)
- 1817—published *On The Principles of Political Economy and Taxation,* with urging from James Mill, father of John S. Mill.
- 1819-1823 (death)—served in House of Commons (UK), calling for free trade.

Source: Steve Gardner, "History of Economic Thought"

Biography of David Ricardo (cont.)

(1772 -1823)

David Ricardo never attended college. But he delved into economic theory with more competence than any academic.

He never formally studied financial markets. Yet he made millions of pounds in the stock market.

His powerful mind and practical knowledge so dominated intellectual foes that he could win fiery debates and then dismiss the rival argument, saying that only a university professor would be silly enough to believe it.

- excerpts from Todd Buchholz's *New Ideas From Dead Economists*

Ricardo and Comparative Advantage

- Nobel laureate Paul Samuelson was once challenged by the mathematician Stanislaw Ulam to "*name me one proposition in all of the social sciences which is both true and non-trivial (or not so obvious)."*

- It was several years later that Samuelson thought of the correct response: **comparative advantage**.

  "That it (theory of comparative advantage) is logically true need not be argued before a mathematician; that is not trivial is attested by the thousands of important and intelligent men **who have never been able to grasp the doctrine for themselves or to believe it after it was explained to them."**

Some Comments on the Theory

- Perhaps one of the most complex and counterintuitive principles of economics
- Tricky but brilliant
- The key to modern economic thinking
- Few politicians then or now can follow the analysis. As a result, quotas, tariffs, and trade wars mar the world's economic history

A 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

- The domestic country is more efficient in producing both cheese and wine, since $a_{LC} < a^*_{LC}$ and $a_{LW} < a^*_{LW}$.
- Since foreign country is inferior in producing both cheese and wine, **does that mean there won't be any benefits for domestic country to trade with foreign country???** (we shall see…)

A Numerical Example (cont.)

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

- Now we compare the production efficiency in relative terms.
- When compared to foreign country, the ***relative*** efficiency of domestic country for producing cheese is a_{LC} / a^*_{LC} =1/6, and the *relative* efficiency for producing wine is a_{LW}/a^*_{LW} = 2/3. Because (a_{LC} / a^*_{LC} =1/6) < (a_{LW}/a^*_{LW}=2/3), domestic country is **relatively more efficient** in producing cheese than wine.

A Numerical Example (cont.)

- So we know domestic country is **relatively more efficient** in producing cheese than wine.
- In this case, we say domestic country enjoys a **comparative advantage** in producing cheese, and foreign country enjoys a **comparative advantage** in producing wine.
- Be reminded - although foreign country is less efficient in **both** industries, nonetheless it has a *comparative* advantage in wine production.
- This is different from the case of absolute advantage, where…

A Numerical Example: the case of absolute advantage

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

- In this case, since $a_{LC} < a^*_{LC}$, while $a_{LW} > a^*_{LW}$, we say domestic country has an *absolute* advantage is producing cheese, while foreign country has an absolute advantage in producing wine.
- It's obvious that trade will be beneficial to both countries when each country has an absolute advantage, but no so obvious when countries have comparative advantage

The Opportunity-Cost Perspective

- Now let's look at the concept of comparative advantage from another angle – in terms of "*opportunity cost".*
- So what is opportunity cost, then?
  - For example, what is your opportunity cost of coming to study at CBS?
- The following quiz will be most helpful…

Key Concept

- What is opportunity cost? A Quiz…

  You won a free ticket to see the **U2** concert (which has no resale value). **Bob Dylan** is performing on the same night and is your next-best alternative. Tickets to see Dylan cost $40. On any given day, you would be willing to pay up to $50 to see Dylan. Assume there are no other costs of seeing either performer. Based on this information, ***what is your opportunity cost of seeing U2?***

  A) $0
  B) $10
  C) $40
  D) $50.

Key Concepts

- What is opportunity cost?
  - Opportunity cost (of choosing A) is the potential gain that you may get when choosing B, your next best alternative.
  - Remember opportunity cost is a gain, NOT a cost – this easily confuses you!
  - In other words, opportunity cost is the *foregone benefits* of not choosing the best alternative, B.
  - In the previous example, the potential gain of seeing Bob Dylan on that particular night, or the opportunity cost of seeing U2 on that night, is $50-$40 =$10.

The Opportunity-Cost Perspective (cont.)

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

- The opportunity cost of domestic country producing 1 kg of cheese (using 1 hour) is 0.5 (=1/2) Liter of wine. Similarly, the opportunity cost of foreign country (producing 1 kg of cheese) is 2 (=6/3) Liters of wine.
- Since 0.5<2, or when the opportunity cost of producing cheese is lower than that of foreign country thus we say domestic country has a comparative advantage in producing cheese.
- In other words, this says when domestic country produces cheese, the foregone benefits are smaller compared to the foregone benefits of foreign country, so domestic country has a comparative advantage in producing cheese.

The Opportunity-Cost Perspective (cont.)

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

- The same is true for foreign country to produce wine.
- The opportunity cost of foreign country producing 1 liter of wine (using 3 labor hours) is 0.5 (=3/6) kg of cheese. Similarly, the opportunity cost of domestic country (producing 1 liter of wine) is 2 (=2/1) kg of cheese.
- When foreign country produces wine, the foregone benefits (i.e., 0.5 kg of cheese) are smaller, compared to the foregone benefits of domestic country (i.e., 2 kg of cheese), so foreign country has a comparative advantage in producing wine.

Again, what's the intuition?

- Comparative advantage is the same thing as *relative* advantage.

- One country can have absolute advantage in producing all things, but its comparative advantage lies in where it's best at, i.e., where it can produce with the most efficiency, ***relatively***.

- From the perspective of opportunity cost, a country has a comparative advantage in an industry (or in production), where its foregone benefits are **smaller** (or smallest) than that of foreign country (or countries).

Gains from Trade

- The case of absolute advantage
- It's quite easy to understand the gains from trade when each country enjoys their absolute advantage in producing one good.
- For example:

Unit labor requirements	US	UK
Food (hr/kg)	0.01	0.02
Cloth (hr/m)	0.02	0.01

➔ US has absolute advantage in producing food; UK has absolute advantage in producing cloth.

Source: the example is adopted from Alan Deardorff, Introduction to Comparative Advantage

Gains from Trade

- The case of absolute advantage
- Let's say, both economies are endowed with 10 workers. So the US could produce at most 1000 kgs of food per hour (=10/0.01), or 500 m of cloth per hour (=10/0.02), or any combination of the two.
- Likewise, the UK could produce at most 500 kgs of food per hour, 1000 m of cloth per hour, or some combination of the two.
- Now without trade (or in autarky), when the countries must each consume only what they produce, each country choose to put 4 (for example) workers into producing the good where it has the higher productivity and 6 workers into producing the other, so we have:

Production and consumption in autarky	US	UK
Food (kg/hr)	400	300
Cloth (m/hr)	300	400

For the US, with 4 workers producing food, they produce 4/0.01=400 kg/hr. The remaining 6 workers produce 300 (=6/0.02) m of cloth per hour. The situation is just the opposite in the UK.

Gains from Trade

- The case of absolute advantage
- Now with trade. It makes sense that each country specialize in the good where it is more productive, and let's see what happens.
- When the US specializes in food production, it can produce 10/0.01=1000 kg/hr; and the UK can produce cloth at 10/0.01=1000 m/hr.
- And each country trade half of what it produces, then we have:

Production and consumption with trade	US	UK
Food (kg/hr)	500	500
Cloth (m/hr)	500	500

Gains from Trade

- The case of absolute advantage
- Compare the two tables, we have

Production and consumption in autarky	US	UK
Food (kg/hr)	400	300
Cloth (m/hr)	300	400

vs

Production and consumption with trade	US	UK
Food (kg/hr)	500	500
Cloth (m/hr)	500	500

- **By specializing and trading,**
  - **The total world output increased, 2000 vs. 1400.**
  - **Both countries have been able to increase their consumption on both goods, from 300 or 400 to 500. And living standards in both countries have increased.**

Gains from Trade

- **The case of <u>absolute advantage</u>**

- The result is not surprising. After all, it's Adam Smith's old idea of specialization – each country's workers are absolutely better at doing one thing than the workers of the other country, and we've gained from having them do more of what are better at.

- The results may vary a little bit depending on how much countries trade with each other, but one thing is clear: with free trade, the total output increases and consumption in each country also increases.

Gains from Trade

- **The case of <u>comparative advantage</u>**
- What if one country's workers do not have absolute advantage in doing anything? Let's change the setup a little bit. Now we have,

Unit labor requirements	US	China
Food (hr/kg)	0.01	0.20
Cloth (hr/m)	0.02	0.10

- In this case, US is 20[=(1/0.01)/(1/0.2)] times as efficient as China in producing food, and 5 times as efficient as China in producing cloth. Thus, the US has absolute advantage in producing both goods, while China's absolute advantage is none. Will free trade still benefit the US?

- In terms of comparative advantage, since the US's advantage is **smaller** in producing cloth (5<20), so the US has comparative advantage in producing food, and China has comparative advantage in producing cloth.

Gains from Trade

- **The case of <u>comparative advantage</u>**
- Let's assume that China has ten times as many workers as the US, i.e, the US is endowed with 10 workers, and China with 100 workers.
- In autarky, let's put 4 workers in the US to work in producing food, and 40 of Chinese workers in producing cloth, then we have,

Production and consumption in autarky	US	China
Food (kg/hr)	400	300
Cloth (m/hr)	300	400

Gains from Trade

- **The case of <u>comparative advantage</u>**

- Now let each country completely specialize according to their comparative advantage. Then China produces **1000 m** cloth per hour, and the US **1000 kg** food per hour.
- Again, they trade half what they produce with each other, then we have,

Production and consumption in autarky	US	China
Food (kg/hr)	400	300
Cloth (m/hr)	300	400

→

Production and consumption with trade	US	China
Food (kg/hr)	500	500
Cloth (m/hr)	500	500

- **And again, we observe gains from trade, world's total output increases and both countries consume more than in autarky. The welfare in both countries have improved.**

Key Insights

- The key insights of Ricardo's analysis: free trade makes it possible for households to consume more goods (thus better living standards) at better prices regardless of whether trading partners are more or less economically advanced.

- 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 comparative advantage.

Sources of Comparative Advantage

- In previous examples, comparative advantage came from higher labor productivity – countries specialize in their most effcient production

- So far, we have not considered wage differences between countries. For example, let's assume:
  - in bicycle production, Denmark is 2 times as efficient as China, i.e., $\frac{a_{dk}}{a_{cn}} = \frac{1}{2}$, but Denmark's labor cost (wage, w) is 10 times as China's, i.e., $\frac{w_{dk}}{w_{cn}} = 10$.
  - So adjusted for wage difference, the cost of production becomes: $a_{dk} \cdot w_{dk} > a_{cn} \cdot w_{cn}$, since $\frac{a_{dk}}{a_{cn}} \cdot \frac{w_{dk}}{w_{cn}} = \frac{1}{2} \cdot 10 = 5 > 1$.
  - In other words, Denmark's small efficiency lead was more than offset by China's large wage advantage. Denmark should not specialize in making bikes; otherwise, consumer will end up paying much higher prices.

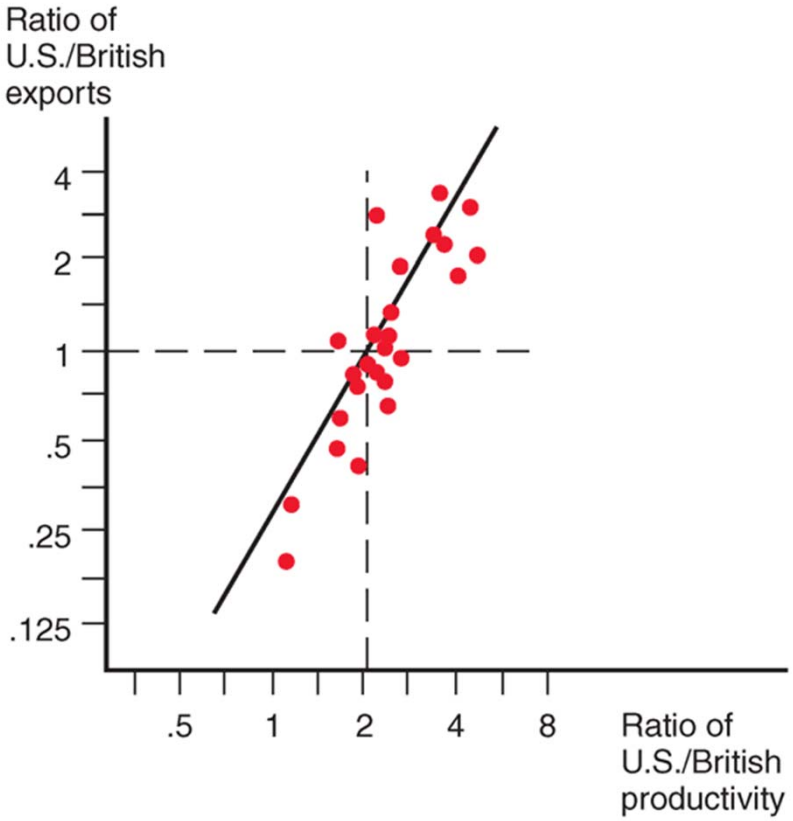
Predictions of Ricardo's Theory

- Trade between two countries can benefit both countries if each country exports the goods in which is has a comparative advantage.

- The potential gains offer countries (or firms) incentives to trade and it partly determines trade flows between countries.

Empirical Evidence

Do countries export those goods in which their productivity is relatively high?



The ratio of U.S. to British exports in 1951 compared to the ratio of U.S. to British labor productivity in 26 manufacturing industries suggests yes.

At this time the U.S. had an absolute advantage in *all* 26 industries, yet the ratio of exports was low in the least productive sectors of the U.S.

Empirical Evidence (cont.)

China versus Germany, 1995

	Chinese output per worker as % of Germany	Total Chinese output as % of Germany
All manufacturing	5.2	71.6
Apparel	19.7	802.2

Source: Ren Ruoen and Bai Manying, "China's Manufacturing Industry in an International Perspective: A China-Germany Comparison," *Economie internationale,* no. 92–2002/4, pp. 103–130.

Empirical Evidence (cont.)

Labor productivity in manufacturing: China vs. US

Comparative Productivity by Manufacturing Branch (China/USA, 1995-2004, USA=100)

	(1) food and beverages	(2) textile	(3) clothing	(4) leather	(5) wood products	(6) paper and printing	(7) coal	(8) petroleum	(9) chemicals	(10) building materials	(11) metallur-gical	(12) machinery	(13) power	(14) other manufactu-ring	(15) total manufactu-ring
1995	9.6	27.4	30.7	10.1	4.2	3.1	0.5	3.2	3.3	6.8	5.9	4.1	2.1	9.5	5.6
1996	11.5	29.3	41.1	15.3	5.2	5.2	0.7	2.3	4.0	6.6	5.6	4.5	2.5	11.9	6.5
1997	13.3	31.5	37.4	15.1	6.4	5.4	0.7	2.7	4.0	6.3	5.3	5.1	3.0	10.8	6.9
1998	13.0	30.7	36.5	17.3	5.8	5.0	0.7	5.0	4.2	6.6	5.4	6.3	3.9	12.0	7.4
1999	16.7	35.4	34.1	12.7	8.0	5.9	0.7	5.3	4.3	6.9	6.1	7.9	4.0	10.2	8.6
2000	18.2	43.2	38.8	12.2	10.2	6.0	0.8	15.5	4.2	7.6	7.5	9.8	3.6	12.3	10.4
2001	18.8	50.9	45.9	13.2	13.5	7.8	1.2	17.2	4.7	8.8	9.3	12.1	3.6	12.5	12.1
2002	19.4	54.0	43.5	17.2	10.6	8.7	1.5	22.8	4.9	9.3	10.1	13.8	4.4	10.0	12.7
2003	20.8	67.5	49.6	15.7	11.4	9.2	2.1	9.9	5.1	12.2	13.4	15.1	3.3	9.0	14.1
2004	24.6	83.5	59.9	12.6	10.3	9.5	3.1	8.7	5.4	14.0	17.2	16.5	3.5	9.6	15.8

Source: Deng and Jefferson (2009)

Misconceptions about Comparative Advantage

1. Free trade is beneficial only if a country is more productive than foreign countries.
   - But even an unproductive country benefits from free trade by avoiding the high costs for goods that it would otherwise have to produce domestically.
   - High costs derive from inefficient use of resources.
   - The benefits of free trade do not depend on absolute advantage (Adam Smith), rather they depend on comparative advantage: specializing in industries that use resources relatively more efficiently.

Misconceptions about Comparative Advantage

2. Free trade with countries that pay low wages hurts high wage countries.
   - While trade may reduce wages for *some* workers, thereby affecting the distribution of income within a country, trade benefits a larger mass of consumers and other workers.
   - Consumers benefit because they can purchase goods more cheaply.
   - Producers/workers benefit by earning a higher income in the industries that use resources more efficiently, allowing them to earn higher prices and wages.
   - It's a trade-off !!! As long as the overall gains are positive, the country's welfare will improve.

Misconceptions about Comparative Advantage

3. Free trade exploits less productive (poor) countries.
   - While labor standards in some countries are less than exemplary compared to Western standards, they are so with or without trade. Trade did not cause it in the first place.
   - Consumers in poor countries benefit from free trade by having access to more efficiently produced goods at lower prices.
   - They also benefit from accessing to a larger variety of goods that would not otherwise be available to them.
   - These are all parts of higher living standards.

More Applications of the Theory

For general discussion:

At the dawn of the Internet age, in late 1990s, in China and India, there were a lot of talks and debates over technology "leapfrogging". The argument is that since the Internet is a completely new technology, every country basically stands at the same level. This gives poorer countries with rich human resources a rare opportunity to catch up. Thus, developing countries can have a development path completely different from the past, deviating from what the theory of comparative advantage predicts.

Your thoughts?

For the next class…

- Read Chapter 4, HO model
- Read ”*How China Helps America’s Poor*” on course website