Economics 364 Professor Muniagurria

Answer Key to Problem Set 1

Ricardian Model and Comparative Advantage

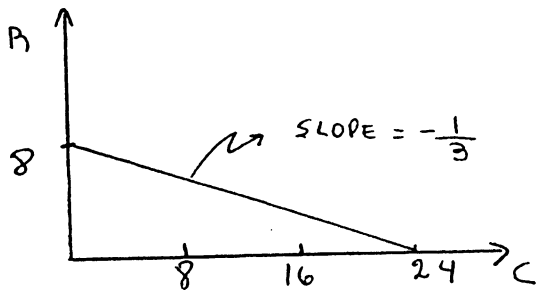
(I) Analyze the following two countries with linear (constant opportunity cost) production functions. The production technology is given by the following unit labor coefficients:

	United States	Thailand (*)
Rice	3	4
Computers	1	3

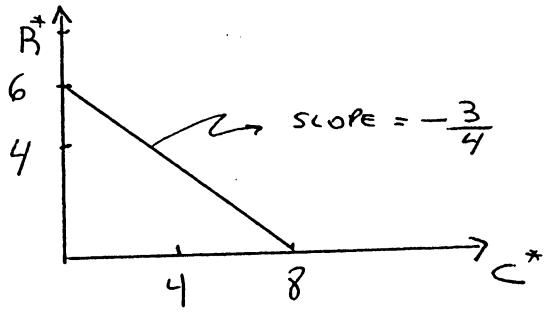
Each coefficient indicates the number of hours of labor needed to produce a commodity in a given country.
The total labor endowment in each country is 24 hours and consumers like both commodities.

(1) Graph the PPFs for the US and Thailand on two graphs (put Rice on the vertical axis).

US FULL EMPLOYMENT CONDITION: $24 = 3.R + 1.C$



THAILAND FULL EMPLOYMENT CONDITION: $24 = 4.R^* + 3.C^*$



(2) Answer the following question. **Justify briefly each of them.**

Which country has the absolute advantage in producing Rice?

The US HAS AN ABSOLUTE ADVANTAGE IN RICE

BECAUSE: $a_R = 3 < a^*_R = 4$

Which country has the absolute advantage in producing Computers?

THE US HAS AN ABSOLUTE ADVANTAGE IN PRODUCING COMPUTERS

BECAUSE: $a_C = 1 < a^*_C = 3$

Which country has the comparative advantage in Computer production? THE US.
JUSTIFICATION: EITHER (i) OR (ii) WILL WORK.

(i) BECAUSE THE US IS RELATIVELY MORE EFFICIENT IN COMPUTERS THAN IN RICE:

$$\frac{a_C}{a^*_C} = \frac{1}{3} < \frac{a_R}{a^*_R} = \frac{3}{4}$$

(ii) BECAUSE IN THE US THE OPPORTUNITY COST OF COMPUTERS IN TERMS OF RICE IS SMALLER THAN IN THAILAND:

$$\frac{a_C}{a_R} = \frac{1}{3} < \frac{a^*_C}{a^*_R}$$

Which country has the comparative advantage in Rice production? THAILAND.
JUSTIFICATION: EITHER (i) OR (ii) WILL WORK.

(i) BECAUSE THAILAND IN RELATIVELY MORE EFFICIENT (i.e. LESS INEFFICIENT IN THIS CASE) IN RICE THAN IN COMPUTERS:

$$\frac{a^*_R}{a_R} = \frac{4}{3} < \frac{a^*_C}{a_C} = \frac{3}{1}$$

(ii) BECAUSE THE OPPORTUNITY COST OF RICE IN TERMS OF COMPUTERS IS SMALLER IN THAILAND THAN IN THE US:

$$\frac{a^*_R}{a^*_C} = \frac{4}{3} < \frac{a_R}{a_C} = \frac{3}{1}$$

(3) What was the autarky relative price Computers in terms of Rice (P_C/P_R) in the US? In Thailand?

SINCE CONSUMERS LIKE BOTH COMMODITIES, THE AUTARKY PRICES COINCIDE WITH THE SCOPE OF THE COUNTRY'S PPF. THEREFORE:

$$\left(\frac{P_C}{P_R}\right)^{US} = \frac{1}{3} \quad \text{AND} \quad \left(\frac{P_C}{P_R}\right)^{THAILAND} = \frac{3}{4}$$

What is the range of free trade relative prices of Computers in terms of Rice that could support free trade (i.e. an equilibrium with a positive volume of imports and exports from both countries) between the two countries?

ANY RELATIVE PRICE IN BETWEEN THE TWO AUTARKY RELATIVE PRICES COULD WORK.
THAT IS

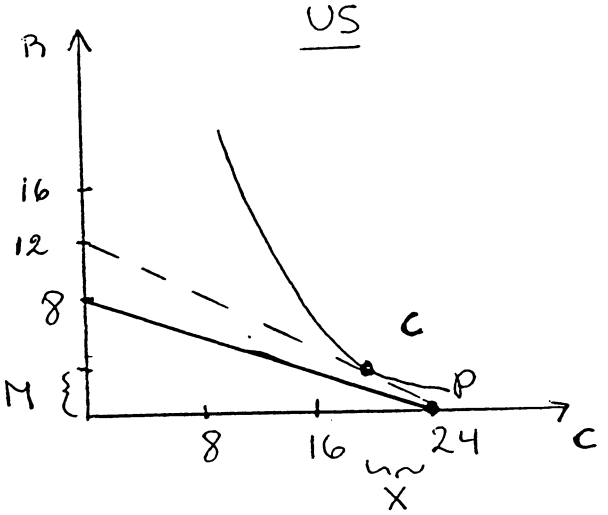
$$\frac{1}{3} < \left(\frac{P_C}{P_R}\right)^{FREE\ TRADE} < \frac{3}{4}$$

(4) Suppose that after free trade occurs between the two countries, the relative price of Computers is ½ (i.e. $P_C / P_R = ½$). On a new graph for each country show the following information (remember to put Rice on the vertical axis).

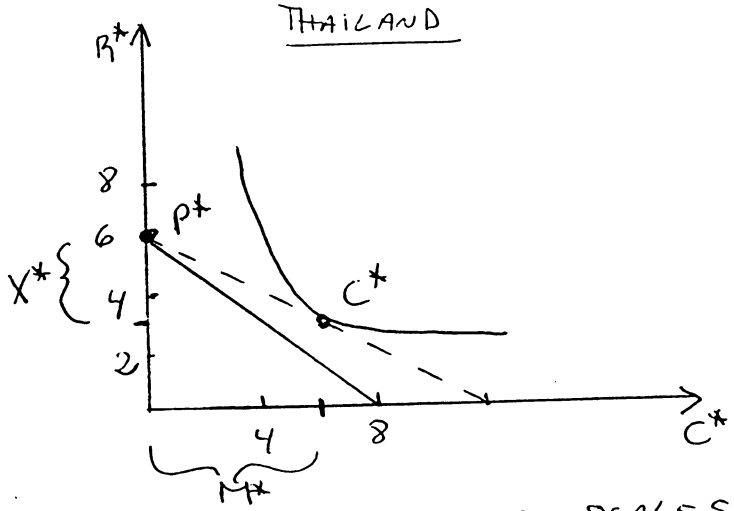
Production and consumption allocations for each country (label them P , C and P*, C*)

Imports and exports for each country.

US



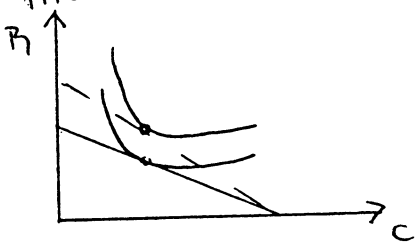
THAILAND

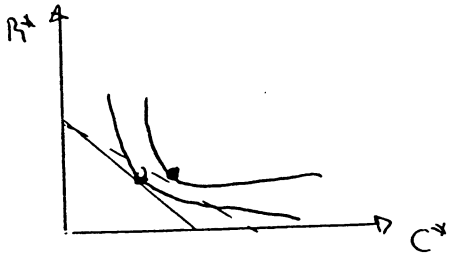


NOTICE THAT FOR CLARITY WE USED DIFFERENT SCALES FOR THE US AND THAILAND.

(5) Did the two countries enjoy welfare improvements or losses as a result of free trade? Justify (i.e. compare the level of utility in Autarky and Free Trade)

BOTH COUNTRIES ARE BETTER OFF. FREE TRADE HAS ALLOWED THEM TO CONSUME AT POINTS ABOVE THEIR PPF'S, AND THUS TO REACH A HIGHER INDIFFERENCE CURVE.





Productivity changes: Technological improvement

(II) For Thailand, suppose that new methods of production are discovered that double the marginal productivity of labor in each sector (i.e. multiply MPL^*_R for two, and multiply MPL^*_C by two). Will the pattern of trade specialization and trade change? (i.e. will countries continue to specialize in the same commodity and will the commodities imported and exported remain the same?)

SINCE LABOR PRODUCTIVITY DOUBLES $\Rightarrow$ a^*_i'S ARE DIVIDED BY 2.

$\Rightarrow$ "NEW" $a^*_C = 1.5$, "NEW" $a^*_R = 2$

HOWEVER THE OPPORTUNITY COST OF C^* IN TERMS OF R^* HAS NOT CHANGED (i.e. $\frac{a^*_C}{a^*_R}^{OLD} = \frac{3}{4} = \frac{a^*_C}{a^*_R}^{NEW} = \frac{1.5}{2}$), THE US STILL HAS A C.A IN COMPUTERS, THAILAND IN RICE SO THE PATTERN OF TRADE AND SPECIALIZATION WILL NOT CHANGE.

Welfare, Wages and Average Costs:

(III) Answer the following questions.

(1) In autarky, what is the real wage in terms of Computers and the real wage in terms of Rice in the US? In Thailand? IN AUTARKY BOTH COUNTRIES PRODUCE BOTH COMMODITIES, SO THE REAL WAGE IN TERMS OF ONE GOOD IS JUST THE MARGINAL PRODUCT OF LABOR IN THE RELEVANT GOOD (i.e. $1/a$).

US

REAL WAGE IN TERMS OF COMPUTERS: $\frac{w}{P_C} = MPL_C = 1$

REAL WAGE IN TERMS OF RICE: $\frac{w}{P_R} = MPL_R = \frac{1}{3}$

THAILAND

$\frac{w^*}{P_C^*} = MPL_C^* = \frac{1}{3}$

$\frac{w^*}{P_R^*} = MPL_R^* = \frac{1}{4}$

(2) After free trade arises, what is the real wage in terms of Rice and the real wage in terms of Computers in the US? In Thailand?

US: PRODUCES ONLY COMPUTERS $\Rightarrow$ $\frac{w}{P_C^{FT}} = MPL_C = 1$

$\frac{w}{P_R^{FT}} = \frac{w}{P_C^{FT}} \frac{P_C^{FT}}{P_R^{FT}} = 1 \cdot \frac{1}{2} = \frac{1}{2}$

THAILAND: PRODUCES ONLY RICE $\Rightarrow$ $\frac{w^*}{P_R^{FT}} = MPL_R^* = \frac{1}{4}$

$\frac{w}{P_C^{FT}} = \frac{w}{P_R^{FT}} \frac{P_R^{FT}}{P_C^{FT}} = \frac{1}{4} \cdot 2 = \frac{1}{2}$

(3) Suppose now that free trade occurs at the free trade prices given earlier and in fact, assume $P_C = 1$. What is the average cost of Rice and the average cost of Computers in the US? In Thailand? WE FIRST CALCULATE THE WAGE AND THEN COSTS.

IF $\boxed{P_C^{FT} = 1} \Rightarrow \boxed{P_R^{FT} = 2}$ (BECAUSE $P_C^{FT}/P_R^{FT} = 1/2$)

US

(i) WE CALCULATE THE WAGE. US PRODUCES COMPUTERS $\Rightarrow$ $\frac{w}{P_C^{FT}} = MPL_C = 1 \Rightarrow \boxed{w = 1 \cdot P_C^{FT} = 1}$ ($P_C^{FT} = 1$)

(ii) WE CALCULATE COSTS:

$AC_C = a_C \cdot w = 1 \cdot 1 = 1$

$AC_R = a_R \cdot w = 3 \cdot 1 = 3$

THAILAND

(i) WE CALCULATE THE WAGE. THAILAND PRODUCES RICE $\Rightarrow$ $\frac{w^*}{P_R^{FT}} = MPL_R^* = \frac{1}{4} \Rightarrow w^* = \frac{1}{4} \cdot P_R^{FT} = \frac{1}{2}$ ($P_R^{FT} = 2$)

(ii) WE CALCULATE COSTS:

$AC_C^* = a_C^* \cdot w^* = 3 \cdot \frac{1}{2} = 1.5$

$AC_R^* = a_R^* \cdot w^* = 4 \cdot \frac{1}{2} = 2$

(4) Comparing countries, which country has higher wages? What do you notice about the relationship between trade and average cost? Discuss how these issues correspond to the article "Not So Absolutely Fabulous" The Economist, 4-11-95 (RP 4).

(a) THE US HAS HIGHER WAGES (REAL AND NOMINAL) THAN THAILAND.

(b) THE COUNTRY THAT SPECIALIZES IN AND EXPORTS A GOOD IS THE COUNTRY THAT HAS THE LOWEST AC IN PRODUCING THE GOOD (THE AC OF COMPUTERS IS LOWEST IN THE US, THE AC OF RICE IS LOWEST IN THAILAND). A COUNTRY THAT CAN PRODUCE A GOOD AT THE LOWEST AC CAN SELL IT FOR THE LOWEST PRICE ON WORLD MARKETS. THUS, IT WILL BE THE EXPORTER OF THAT GOOD.
THE AC IS DETERMINED BY THE WAGE YOU NEED TO PAY TO YOUR WORKERS AND BY THE PRODUCTIVITY OF THOSE WORKERS. A COUNTRY WHICH HAS HIGHER PRODUCTIVITY CAN AFFORD TO PAY HIGHER WAGES, WHILE A COUNTRY WITH LOWER PRODUCTIVITY CAN ONLY TRADE IF IT HAS A WAGE LOW ENOUGH TO ALLOW IT THE LOWEST COST OF PRODUCTION IN ITS EXPORT GOOD.
THE ARTICLE "NOT SO....." DEMONSTRATES THAT THIS IS TRUE IN PRACTICE AS WELL AS IN THEORY. ALTHOUGH SOME COUNTRIES HAVE VERY LOW WAGES THEY WILL NOT NECESSARILY BE THE LOW COST PRODUCER (EXPORTER) OF A PARTICULAR GOOD.
HIGH WAGE COUNTRIES CAN BE THE LOW COST PRODUCER OF A PARTICULAR COMMODITY IF PRODUCTIVITY IS SUFFICIENTLY HIGH.