

Ricardian model

Problem №1

Consider a Ricardian model with a continuum of goods as formulated in the class. Recall that the equilibrium in this model is determined by the interception of two curves:

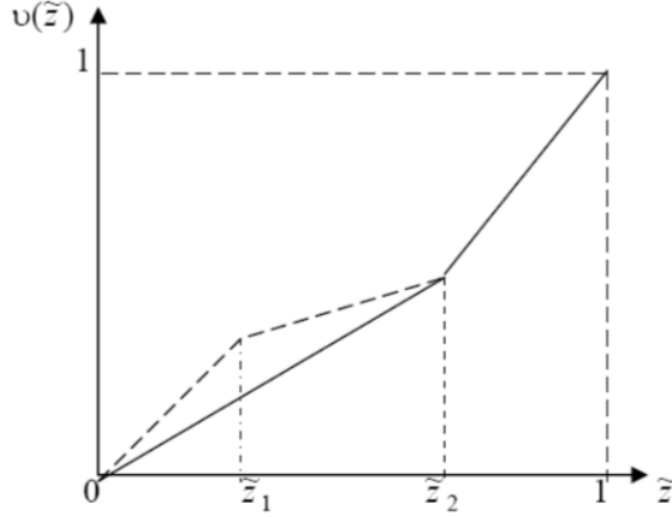
$$\begin{aligned}\frac{w}{w^*} &= \frac{a^*(\tilde{z})}{a(\tilde{z})} \equiv A(\tilde{z}) \text{ and} \\ \frac{w}{w^*} &= \frac{\theta(\tilde{z})}{1 - \theta(\tilde{z})} \frac{L^*}{L}.\end{aligned}$$

1. Describe **briefly** in words how these curves can be derived (there is no need to provide mathematical derivations). In other words, interpret these curves. Draw a corresponding picture.
2. Assume that now $a^*(z)$ uniformly increases: $a_{new}^*(z) = \lambda a_{old}^*(z)$ with $\lambda > 1$. Using the picture describe the effects of such a change on the equilibrium outcomes. Explain **briefly** the intuition behind them.
3. Do the countries gain or lose from the above change in $a^*(z)$? Here, you need to provide just an answer and the intuition/explanation, **there is no need to prove the answer formally**.

Problem №2

In the Dornbusch, Fischer and Samuelson (1977) model, suppose the $v(\tilde{z})$ function changes for all consumers from the solid curve to the broken curve below. (Recall that this function indicates the fraction of total income spent on goods with index $z \leq \tilde{z}$.) That is,

$$v(\tilde{z}) = \int_0^{\tilde{z}} b(z) dz.$$



- (a) At unchanged prices, for which goods, if any, has demand increased and for which goods has demand decreased.
- (b) Determine the effect of this change on free trade equilibrium prices of all goods relative to labor in both countries and on the pattern of specialization and trade. Assume that in the initial equilibrium, \tilde{z}_2 marks the division between exports and imports.
- (c) Repeat part (b), letting \tilde{z}_1 be the initial division between exports and imports.

Problem №3

Consider a Ricardian model with a continuum of goods, indexed by $z \in [0,1]$, and two countries, indexed by $i = N, S$, each endowed with L_i units of labor. w_i denotes the wage in each country. Constant unit labor requirements in country i and industry z are given by:

$$a_i(z) = \alpha_i e^{\beta_i z},$$

where $\alpha_S > \alpha_N > 0$ and $\beta_S > \beta_N > 0$. Hence North (N) has an absolute advantage in all goods and a comparative advantage in high- z goods. Consumers have identical Cobb-Douglas preferences in both countries represented by the following utility function:

$$U_i = \int_0^1 \ln c_i(z) dz.$$

- (a) Solve implicitly for the relative wage, w_N/w_S , and the “cut-off” good, \tilde{z} . Explain your derivations.
- (b) Study the welfare implications in both countries of a decrease in α_S . Assume that α_S changes to α'_S where $\alpha'_S < \alpha_S$. Explain your results.

Problem №4

Consider a Ricardian model with two goods, computers and steel, and two countries, Home and Foreign. To produce one computer, Home and Foreign need 8 and 4 labor units, respectively. To produce one tonne of steel, Home and Foreign need 3 and 3 units of labor, respectively. Labor endowment in Home is 24, in Foreign 72. The consumer preferences are identical in both countries and represented by the Leontieff utility function:

$$U = \min(C_C, 3C_S),$$

where C_C is the consumption of computers, C_S is the consumption of steel.

- (a) Which country has a comparative advantage in producing computers?
- (b) Construct the world relative supply curve for computers (with respect to steel). Draw a corresponding picture.
- (c) Find the equilibrium under free trade: the relative price of computers, consumption and production in each country, the volume of trade, and the pattern of specialization. Illustrate with a proper picture.
- (d) Assume that the labor endowment in Foreign increases from 72 to 160. Find the new relative price and illustrate changes in the equilibrium using a proper picture. What will be the effect on welfare in Home? Explain your answer.

Problem №5

Consider the Ricardian model with 2 countries, *Home* and *Foreign*. The only factor of production is labor. *Home* and *Foreign* are endowed with 150 and 300 units of labor respectively. There are 2 goods, textiles (T) and computers (C). Production technologies are described by means of unit labor coefficients:

$$\begin{aligned} a_T &= 3, & a_C &= 4, \\ a_T^* &= 2, & a_C^* &= 4, \end{aligned}$$

where “*” denotes *Foreign*. Preferences of consumers are identical in both countries and represented by the utility function:

$$U = \min(3 \cdot C_T, 4 \cdot C_C),$$

where C_C denotes consumption of computers and C_T denotes consumption of textiles.

1. Which country has a comparative advantage in computers and which country has a comparative advantage in textiles? What about absolute advantage?
2. Determine the relative price for computers in the world market equilibrium. Describe the specialization pattern that arises in the world market equilibrium.

3. Derive the amounts *Foreign* produces and consumes in equilibrium. Does the country gains from trade? Explain your answers!
4. Assume both countries engage in a free trade agreement with a third country. The third country is endowed with 90 units of labor. It has the same preferences and its production technology is described by the following unit labor coefficients:

$$a_C^{third} = 1 \quad a_T^{third} = 5.$$

Find the new relative price of computers in the new world market equilibrium. Which specialization pattern arises in the new equilibrium.

5. Does *Foreign* benefit from the trade agreement with the third country compared to the trade equilibrium in question 3? Explain your answer!

Problem №6

Consider a standard Ricardian model with a continuum of goods. Assume that the foreign country exhibits a uniform technological progress, meaning that $a_{new}^*(z) = \lambda a_{old}^*(z)$ with $\lambda < 1$. In words, fewer units of labor are required to produce one unit of any good.

- 1) Illustrate with the help of a picture changes in the equilibrium outcome. Explain the economic intuition behind these changes.
- 2) What is the effect of these changes on welfare at Home? What about Foreign?

Problem №7

Consider a world of two countries, Home and Foreign, and two goods, cars (C) and tires (T), produced under perfect competition. The corresponding labour endowments in the countries are $L = 200$ and $L^* = 80$. The production technologies in both countries are described by the following labour coefficients: $a_C = a_T = 2$ and $a_C^* = 1$ and $a_T^* = 0.5$. Labor is perfectly mobile between industries. Assume that consumers in both countries have the following utility function $U = \min(C_C, C_T/4)$, where C denotes consumption of the corresponding good.

- 1) Derive equilibrium prices for cars and tires in autarky.
- 2) What are the amounts of goods produced and consumed by Home in autarky?
- 3) In which goods do the countries have a comparative advantage and an absolute advantage? What is the pattern of trade?
- 4) What is the equilibrium world market price?
- 5) What are the amounts of goods produced and consumed in the countries? What is the pattern of specialization?
- 6) What is the impact of trade on welfare in both countries?

Problem №8

Consider the Ricardian model with 2 countries, Home and Foreign. The only factor of production is labor. Home and Foreign are endowed with 100 and 200 units of labor respectively. There are 2 goods, textiles (T) and computers (C). Production technologies are described by means of unit labor coefficients:

$$\begin{aligned}a_T &= 1/2, & a_C &= 1, \\a_T^* &= 1, & a_C^* &= 1,\end{aligned}$$

where “*” denotes Foreign. Preferences of consumers are identical in both countries and represented by the utility function:

$$U = \min(C_T; 2 \cdot C_C);$$

where C_C denotes consumption of computers and C_T denotes consumption of textiles.

1. Which country has a comparative advantage in computers and which country has a comparative advantage in textiles? What about absolute advantage in both products? Explain your answers!
2. Determine the relative price of computers in the world market equilibrium. Describe the production and trade patterns that arise in the world market equilibrium. Explain your answers!
3. Derive the amounts Home produces and consumes in equilibrium. Does the country gains from trade? Explain your answers!
4. Assume that the size of Home increases from 100 to 250. Find the new relative price of computers and describe the changes in the production and trade patterns of the countries. Explain your answers!
5. Does Foreign benefit from the enlargement of Home? Explain your answer and provide the economic intuition!