

You have 90 minutes. Answer both problems and the three short questions.

Problem 1 (25 points)

Productivity growth and terms of trade.

Two countries, Home and Foreign, use one factor, labor, to produce two goods, coats and shoes, C and S . The labor requirements in the Home country are: 2 hours of labor to produce one coat, 2 hours to produce a pair of shoes. The labor requirements in the Foreign country are: 3 hours of labor for coats and 5 hours for shoes. The labor supply are $L = 100$ hours at home and $L^* = 200$ hours in the Foreign country. Preferences are identical in the two countries and are represented by the utility function

$$U(C, S) = \ln C + \ln S.$$

1. Which country has an absolute advantage in producing coats? Which in producing shoes?
2. Which country has a comparative advantage in producing coats?
3. Imagine the two countries are allowed to trade. Draw the world relative supply curve (in terms of $\frac{S}{C}$). For which price range will both countries specialize. What is the world production of coats and shoes when $\frac{p_S}{p_C}$ is in that range? What happens if $\frac{p_S}{p_C}$ is not in this range?
4. Draw the relative demand curve and find the world equilibrium. Find the world prices of coats and shoes and find the wage rates in the two countries (use the normalization $w = 1$). Do countries specialize? What is the pattern of trade?
5. Derive the real wage at home and abroad in terms of coats and shoes, $(\frac{w}{p_C}, \frac{w}{p_S}, \frac{w^*}{p_C}, \frac{w^*}{p_S})$.
6. Suppose productivity in the shoes industry in the Foreign country increases. Thanks to technical improvements now it takes only 3 hours to produce a pair of shoes in the Foreign country. All other parameters of the problem remain the same. What happens to Home comparative advantage in the production of shoes?
7. Draw the new relative supply curve.
8. Draw the relative demand curve and find the world equilibrium. Find prices, wages and pattern of trade after the productivity increase abroad.
9. Derive the real wages at home and abroad in terms of coats and shoes, after the productivity increase.

10. Argue that Home is worse off after this productivity increase. Is that surprising? What happened to relative prices? What happened to relative wages? What happened to trade? Who gains from the productivity increase? Interpret.

Problem 2 (25 points)

Optimal subsidies when production creates an externality.

Intel is considering opening a new plant in Latin America. Brazil and Argentina are both offering the company a subsidy to induce it to invest in their country because they are convinced that such a plant would create important externalities—e.g. because Intel will train local workers. Intel itself is indifferent between moving to one country or the other.

The values that Argentina and Brazil attach to having the plant in one of the two countries are:

$$\text{Plant in } A : (5, 0)$$

$$\text{Plant in } B : (3, 3)$$

that is, if Intel goes to Argentina the country values the plant 5 units, while Brazil thinks that in this case it will reap no externalities. If Intel goes to Brazil, Brazil values having the plant 3 units. Argentina thinks that an Intel plant in nearby Brazil, while not as good as having it at home, will still create an externality, whose value is 3—perhaps because some Argentinian workers will migrate north.

1. Show that if both countries offer a subsidy, Intel will decide to invest in Brazil, which is obviously the best solution. (HINT: start by asking how large a subsidy would each country be willing to offer).
2. Next assume that Intel plans to build 2 plants, and is again indifferent as to their location. The plants are built one after the other. The benefits Argentina and Brazil attach to having these plants depend on where they are located and on the sequence in which they are built, according to the following table.

$$(A, A) \Rightarrow (9, 0)$$

$$(A, B) \Rightarrow (6, 6)$$

$$(B, A) \Rightarrow (7, 7)$$

$$(B, B) \Rightarrow (0, 13)$$

where (X, Y) means that the first plant is built in country X , the second in Country Y . The best solution is obviously to locate one plant in each country and start the investment in Brazil. But assume that the two countries do not coordinate on the first best and offer subsidies independently. Then:

- (a) Start from the decision of where to locate plant 2. Show that, if plant 1 is built in A, then B will attract the second plant by offering a subsidy of 3 units (in reality a penny more than 3 units will be enough); if instead plant 1 is built in B, then A will attract the second plant by offering a subsidy of 6 units—also plus a penny;

- (b) Now go back to the decision where to locate plant 1. Show that A will win the first plant.
- (c) Discuss the effectiveness of subsidies in this case, and compare it with your finding in the first part of the problem.

Short questions (15 points)

1. Based on your knowledge of the Heckscher-Ohlin model comment briefly on the following statement: "Trade openness is always beneficial for workers because it allows them to buy cheaper imports from abroad."
2. A country wishes to protect a car factory, even if it the only car producer in the country and enjoys some monopoly power. Is a quota or a tariff the most efficient way to do it?
3. Give one economic argument for, and one against, the use of tariffs to protect a local "infant" industry.

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