

## Midterm Exam 1

Answer Any **Three Questions**. Answer all parts to each question.

**1.** Europe allows bananas to be imported tariff free from some non-European countries but imposes tariffs (or other restrictions) on imports of bananas from other countries (e.g., those in Central America). These countries have protested this European policy to the WTO. To analyze how a country, such as Guatemala, is affected by this policy consider the following example. Suppose the domestic supply and demand curves for bananas in **Guatemala** are given by:

$$S = 6P^d; \quad D = 80 - 2P^d \quad \text{where } P^d \text{ is the domestic price of bananas (in Guatemala).}$$

- (a) Assuming Guatemala does not trade with the rest of the world, find the equilibrium (autarky) price and the quantity transacted. **(7 points)**
- (b) Assume the price of bananas within Europe is **25**, and assume that this European price will be unchanged if Guatemala is allowed to export its bananas to Europe (since the European market is large compared to Guatemalan production). Assuming Europe originally banned imports from Guatemala, consider what would happen if the WTO ruled that Europe had to allow Guatemalan bananas to be imported tariff-free into Europe.
- i. How does free trade with Europe affect price, production and consumption in *Guatemala*? Find the country's exports under free trade. **(5 points)**
  - ii. Show graphically the changes in consumer and producer surplus due to the movement to free trade. **(4 points)**
  - iii. **Calculate** the gains and losses to each group and the overall gain or loss to Guatemala from this change in European policy. **(7 points)**
- (c) Suppose the government of *Guatemala* wants to help domestic consumers (who are affected by free trade with Europe). Thus, it is considering a plan to sell bananas to consumers in government stores at a price of **15**. The plan would work as follows: the government would buy bananas from growers at the market price (which is the price they get from exporting to Europe) and resell to consumers at a price of **15**. Any losses would be paid by the government from tax revenue (note that this plan is like subsidizing consumption).
- i. How will this plan affect Guatemalan production, consumption and exports? Who gains and who loses from this plan? **(5 points)**
  - ii. Compared to part (b), calculate the changes in consumer surplus, producer surplus and the cost to the government of this plan. What is the overall impact? **(5 points)**

2. Answer all parts.

- a) People who opposed the US free trade agreement with Mexico argued, among other things, that US firms (and workers) could not compete with imports from Mexico, which were produced with much less expensive Mexican labor. These people felt that imports from Mexico would lead to unemployment in the US, to lower US wages and to lower overall US welfare. Use some model studied in class to evaluate this argument. **(11 points)**
- b) Assume there are two countries, the US and Korea. Each country can produce two goods, clothing and food. The supply curve for clothing in the US is:  $S_c = 4(P_c/P_f)$ , whereas the supply curve for clothing in Korea is:  $\bar{S}_c = 12(\bar{P}_c/\bar{P}_f)$ , where  $P_f, P_c$  are US prices and  $\bar{P}_f, \bar{P}_c$  are prices in Korea. As usual, the supply curve in each country represents the marginal cost of producing clothing.
- i. Assume that, prior to trade, the autarky price in the US is  $(P_c/P_f) = 8$ , whereas the autarky price in Korea is  $(\bar{P}_c/\bar{P}_f) = 4$ . Can the same total world output (of 80) be produced at lower total cost? If so, how much clothing should be produced in each country to minimize the total (world) cost of clothing production? **(6 points)**
- ii. How much does the total cost of clothing production decrease as a result of this more efficient pattern of world production? What specifically does this cost reduction measure? Be precise (a numerical answer is required for this question). **(5 points)**
- c) Assume there are two goods (cloth, food) and two countries (US, Japan). Starting from autarky in each country (i.e., no trade), is it always true that both countries will gain from trade? Use a general model to illustrate your answer **(6 points)**
- i. How will economic growth in Japan affect the US? Relate your answer to how the growth affects Japanese production of each good. **(5 points)**

3. Consider the factor-specific model with two goods (computers,  $C$ , and food,  $F$ ). Let  $T$  denote the specific factor used in food production (for example, land) and let  $K$  denote the specific factor used in *computer* production (for example, machinery). Labor is used in both sectors and is mobile between the two sectors. Thus, in terms of equations:

$$Q_c = C(K, L_c); \quad Q_f = F(T, L_f); \quad L_c + L_f \leq L$$

- a) Sketch the production possibility frontier and explain its curvature (how the slope changes as you move along the frontier). Show how you can **derive** the output supply curves for this model. **(5 points)**
- i. Sketch the supply curve for food. What does the area under this curve, between two output levels, measure? Be precise. **(5 points)**

- b) Suppose there are two countries (the US, Canada) that are identical in all respects (including technology) *except* that Canada has more land ( $T$ ) than the US (but the same amount of all other factors). Compare autarky output prices and factor prices in the two countries. Be specific. **(8 points)**
- c) Assume free trade is allowed between the two countries. Use your answer from part (b) to predict the pattern of trade between the countries (US exports and imports). How does free trade affect the real returns to labor, land and capital in each country? Will free trade equalize factor prices between the two countries? Explain your answer. **(8 points)**
- d) Suppose that, due to investment decisions made in prior years, the stock of machinery ( $K$ ) in the US increases. Assuming free trade, explain how this increase in machinery in the US affects the returns to factors in each country, and overall welfare in each country. **(7 points)**

4. Consider a Ricardian model, where each country's **labor requirement (the amount of labor input required per unit output)** are given in the following Table:

Labor input requirements (in hours) per unit output					
	Bikes (B)	Food (F)	Clothes (C)	Glass (G)	Shoes (S)
United States	6	2	8	4	3
Mexico	24	6	12	8	4

- a) Find the autarky relative price of each good (**in terms of food**) in each country. Which country has the higher real wage and standard of living? Why? **(6 points)**
- b) Suppose that initially the US and Mexico sign a trade agreement that **permits** trade only in food and glass, while banning trade in all other goods. What will the pattern of trade be and what is the range of post-trade relative prices (of glass to food) that can prevail? How does this trade affect the real wage (in terms of each good) in each country? Be as specific as possible. **(6 points)**
- c) Suppose a new trade agreement allows free trade in **all** five goods. Will each country *necessarily* continue to export the good that they exported under restricted trade (in part b)? Which good will the US definitely export? Which good will Mexico definitely export? Explain carefully **(6 points)**
- d) Let  $W$  denote the wage in the US, and  $W^*$  the wage in Mexico. Show how U.S. exports vary with the ratio ( $W/W^*$ ) (that is, use a *graph* to show which products the US will export at each ( $W/W^*$ )). **(8 points)**
- e) Suppose that, at current population levels and labor input requirements for each country, Mexico exports only one good while the US exports the other four goods. Discuss how population growth in Mexico will affect the pattern of trade (which goods Mexico exports and imports), the relative prices of goods, and real wages in each country. Is rapid population growth likely to raise or lower the standard of living within Mexico? Explain. **(7 points)**

5. Consider the basic Heckscher-Ohlin model with two goods (food  $F$  and manufactures  $M$ ) and two factors (inputs) of production (capital  $K$  and labor  $L$ ). Each good is produced, using both inputs, under constant returns to scale; in the production of each good, capital can be substituted for labor (so that the input coefficients are NOT fixed). **Assume that good  $M$  is the capital-intensive good.** Further, assume there are two countries (the US and Mexico) that have *identical* technology and tastes, but that the US is endowed with more capital per worker than is Mexico (i.e., the US is capital-abundant).

- a) Explain how the production possibility frontier is derived. Does full employment of labor and capital guarantee production is on the production possibility frontier? If not, what additional condition is needed? **(5 points)**
- i. Assume that, at the current input allocation, in sector  $M$  the MPL (marginal product of labor) is 3 and the MPK (marginal product of capital) is 6, while in sector  $F$  the MPL is 6 and the MPK is 3. How should you reallocate labor and capital between the two sectors in order to increase output of **both** goods? **Be specific.** **(5 points)**
- b) **Given output prices**, show how an increase in the amount of labor alters the output of each good (how it shifts the supply curves) and the factor prices in each country. **(5 points)**
- c) Use the result from part (b) to compare *autarky* **output prices and factor prices (the wage rate and the return on capital)** between the US and Mexico. **(6 points)**
- d) Suppose trade is allowed between the two countries. What will the pattern of trade be, and how will this trade affect output and factor prices in each country? Who gains and who loses from trade in each country? Does trade reduce or eliminate the difference in factor prices between countries? Be specific. **(6 points)**
- i. Suppose, due to superior technology, US producers (of both goods) are more efficient than Mexican firms. Specifically, US producers of good  $M$  are **3 times** as efficient as Mexican firms (i.e., the same amount of inputs produce three times as much of good  $M$  in the US than in Mexico), while US producers of good  $F$  are **2 times** as efficient as their Mexican counterparts. How would this technological difference affect predictions concerning: (1) the pattern of trade; (2) the income redistribution effects of trade; and (3) factor price equalization between the two countries? Would free trade eliminate the incentive for Mexican workers to migrate to the US? Explain. **(6 points)**