

Midterm Exam 2

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

1. Consider a Heckscher-Ohlin (H-O) model with two countries (US, Mexico), two inputs (labor, L ; and capital (machines), K) and two goods (food F and manufactures M). Assume that both production functions exhibit constant returns to scale and that food is always the labor-intensive good. Assume the U.S. has more capital per worker than Mexico but that the two countries have identical technology. The production functions for the two countries are:

$$\text{Mexico: } Q_f = (K_f)^{1/4} (L_f)^{3/4}; Q_m = (K_m)^{3/4} (L_m)^{1/4}$$

$$\text{U.S.: } Q_f = (K_f)^{1/4} (L_f)^{3/4}; Q_m = (K_m)^{3/4} (L_m)^{1/4}$$

(you do **not need** to use these functions to answer the parts below but you may if you want).

In your answer, let W denote the wage rate, R the rental rate on capital, p_m the price of manufactures and p_f the price of food.

- (a) Explain how an increase in the wage rate (W) affects:
- (1) how goods are produced (i.e., the proportion of labor and capital used to produce goods)
 - (2) the marginal cost for producing each good and the relative marginal costs (MC_f / MC_m)
 - (3) and the relative price of goods (p_f / p_m) **(10 points)**
- (b) Given output prices, how will an increase in the number of workers (given the amount of machines) affect the output level of each good? Explain why. **(6 points)**
- i. Use your answer to explain how an increase in the number of workers in a country will affect the autarky *equilibrium* relative price of goods and real factor prices **(8 points)**
- (c) Assume that Mexico and the U.S. have identical technology and identical tastes but that the U.S. has more capital per worker than Mexico. If free trade is allowed between the two countries, use your answers to the previous parts to predict:
- (1) Which good each country will export under free trade;
 - (2) How trade will affect real factor prices in each country. **(8 points)**
- i. Does free trade *potentially* benefit both countries? Will everybody in each country gain from free trade? Be as specific as possible. **(6 points)**
- (d) Starting from free trade, suppose the U.S., imposes an import tariff. How will this tariff affect relative goods prices and real factor prices in the United States and in Mexico? Who in the U.S. gains and who loses from this tariff? **(6 points)**
- i. Given the U.S. import tariff, would Mexican workers have an incentive to find jobs in the U.S.? Would this movement of some labor, from Mexico to the U.S., if allowed, necessarily benefit the U.S.? Explain your reasoning. **(6 points)**

2. (**Labor movements**). Consider a simplified model with two countries (U.S., Mexico) which use two inputs (land, labor) to produce a **single** identical good. Since there is just one good, there is no role for trade in goods. Let $\{T^{us}, L^{us}\}$ and $\{T^{mex}, L^{mex}\}$ denote the amounts of land and people in the U.S. and Mexico, respectively (every person works). Assume the countries have the same resources $\{T^{us} = T^{mex} = 100\}$ and $\{L^{mex} = L^{us} = 100\}$, but the **US has a more productive technology**. Let I represent the number of Mexican guest workers in the U.S. **Output** in each country is:

$$Q^{us} = 100(T^{us})^{1/2}(L^{us} + I)^{1/2}; \quad Q^{mex} = 50(T^{mex})^{1/2}(L^{mex} - I)^{1/2}$$

- a) Assuming no guest workers ($I = 0$), find the wage rate (W), rental rate on land (R) and per capita income $\{(Q^{us}/L^{us}); (Q^{mex}/L^{mex})\}$ in each country. (Full credit requires a numerical answer)(**12 points**)
- b) Assume a guest worker program allows workers to move between the countries; if I Mexicans work in the US, the US work force is $(L^{us} + I)$ and the Mexican work force is $(L^{mex} - I)$. **Assume people choose where to work based solely on where net income is higher**. If workers are free to move between countries, **discuss**:

(1)What determines how many workers move between the countries.

(2)How this labor movement affects total world output.

(3)How this labor movement affects wages, the return on land, and per capita income in each country.

{A numerical answer is not required for this part}. (12 points)

- i. Calculate the equilibrium number of Mexican who will work in the U.S. {A numerical answer is required for this part}. (**7 points**)
- c) Assume the U.S. limits the number of guest workers by using work visas (each Mexican worker needs a visa to work in the U.S.). Let V be the number of visas the U.S. issues, and I^* the number of Mexicans who would work in the U.S. if there were no restrictions, and assume $V < I^*$. Assume the U.S. government auctions visas off to the highest (Mexican) bidders. Let $P(V)$ denote the resulting price for a visa (the notation $P(V)$ indicates the price depends on the number of visas issued). U.S. national income (Y^{us}) is: {U.S. output minus wages paid to Mexican workers plus the revenue from visa sales}. Mexican national income (Y^{mex}) is Mexican output plus the total wages paid to Mexican guest workers in the U.S. minus the cost of the visas. In equations:

$$Y^{us} = Q^{us} - W^{us}V + P(V) \cdot V; \quad Y^{mex} = Q^{mex} + W^{us}V - P(V) \cdot V;$$

- i. Explain how the price of visas is determined and how this price changes as V increases. (**6 points**)
- ii. Explain how wages, world output and Mexican net income changes as V increases. What value of V maximizes world output and Mexican net income? (**6 points**)
- iii. What happens to U.S. net income as V increases? Is U.S. net income maximized by permitting unrestricted labor movement? Explain. (**7 points**)
- {Numerical answers are not required for part c}**

3. Consider the market for corn in a small country (e.g., Malaysia). The domestic supply and demand curves are given by:

$$S = 10P^f; \quad D = 300 - 20P^c$$

where P^f is the price corn producers in Malaysia receive for their output and P^c is the price corn consumers in Malaysia pay for corn (if there are no production subsidies or taxes, and no consumption subsidies or taxes then $P^f = P^c$. Prices are in \$/bushel)

- a) Assume that historically the world price of corn was $P^w = 3$ but a recent surge in corn prices (due to a number of factors, including the use of corn to make ethanol) has increased world prices to $P^w = 6$.
- Calculate Malaysia's domestic production, consumption and imports at $P^w = 3$ **and** its domestic production, consumption and imports at $P^w = 6$ **(7 points)**
 - Calculate how this surge in world corn prices from $P^w = 3$ to $P^w = 6$ affects consumer surplus, producer surplus and overall Malaysian welfare. **(10 points)**
- b) Malaysia's government is concerned about the impact of higher corn prices on domestic consumers and is considering several policies. One policy is an **import subsidy** of \$3 per bushel. Given the world price of $P^w = 6$, calculate the gains and losses to each group (consumers, producers and government subsidy costs) and the overall change in welfare from this policy. **(10 points)**
- Could the government use an import quota instead of an import subsidy to accomplish the same outcomes? Explain. **(6 points)**
- c) A second alternative the government is considering is a domestic consumption subsidy under free trade. Specifically, free trade at the world price $P^w = 6$ would be allowed, but consumers would receive a rebate (or subsidy) of \$3/bushel for corn purchased. Calculate the gains and losses to each group from this policy, **as compared to free trade with no consumption subsidy**. **(10 points)**
- Assuming the government's goal is to help consumers (who were hurt by the surge in world corn prices), which policy is better – the import subsidy or the consumption subsidy? Explain. Can you think of a policy designed to help consumers that would be better than either of these policies? If so, explain the policy and why you think it is better. **(7 points)**