

ECON 462 - International Trade
Midterm Exam

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Use a large blue book to answer the following questions. Always use graphs where they are helpful, especially if they are requested, but be sure to clearly label them, and also explain your answers clearly. Neatness and organization count! You have until 2:25 PM. You will still be challenged for time, so manage it well.

1. (25%) Assume that there are only two countries, Japan and China, each producing only two products, agriculture (A) and industry (I) with the single input of labor under constant costs and perfect competition. Japan has 100 (million) workers, and China has 1,000 (million) workers. It takes 5 Japanese workers to produce one unit of good A and 1 Japanese worker to produce one unit of good I , while it takes 20 Chinese workers to produce one unit of good A and 10 Chinese workers to produce one unit of good I .

- a) Graph the PPFs for both countries, with Q_A on the horizontal axis, and solve for the autarky price ratio P_A/P_I .
- b) Which country has higher wages, and why? Which country has the absolute advantage in each good? Which country has the comparative advantage in which good? What does the Ricardian Theorem predict?
- c) Suppose that preferences are identical, and that each country always spends 60% of its income on good A and 40% on good I (this means that $(P_A Q_A)/(P_I Q_I) = 60/40 = 1.5$, so $RQ = 1.5/RP$, where $RQ = Q_A/Q_I$ and $RP = P_A/P_I$). Solve for each country's utility-maximizing production and consumption choice at autarky, and show this on your PPF graphs using indifference curves.
- d) Graph relative supply and demand for the two countries together, and solve for the equilibrium RQ and RP under free trade.
- e) On your original PPF graphs, show the CPF isovalue line consistent with the new free trade equilibrium. Demonstrate that specialization increased total production, and show how trade increases utility in both countries.

2. (20%) Consider a model of trade between the United States and the European Union, in which the only resources are capital (K) and labor (L). Each country produces only chemicals (C) and electronics (E) under perfect competition, and each sector uses both K and L with constant returns to scale, diminishing marginal returns, and identical technologies. Chemical production is relatively capital-intensive.

- a) Assume that the US is relatively capital abundant. Graph the PPFs for both countries, with Q_C on the horizontal axis, and show the autarky equilibria. How does the relative price (P_C/P_E) differ between countries? How would the wage-rental rate (W/R) differ?
- b) Assume instead that the US and the EU have identical factor proportions, but the US has relatively stronger preferences for electronics. Graph the PPFs for both countries, with Q_C on the horizontal axis, and show the autarky equilibria. How does the relative price differ between countries? How would the wage-rental rate differ?
- c) Under perfect free trade between the two countries, what would you predict would be the pattern of trade between the US and the EU in either case? How would this trade affect the relative price in each country?
- d) Use a three-axis graph to show how free trade would affect the relative price, the wage-rental rate, and the capital-labor ratios for each industry in both countries.

3. (10%) Assume there are only two countries, China and the United States, and there is currently no free trade between them. There are two factors, capital and labor. Labor is significantly more productive in the US, but China has four times as much labor.
- Using a labor allocation graph (what I called a one-dimensional slice of an Edgeworth box), show the wage income of Chinese labor, the returns to Chinese capital, the wage income of US labor, and the returns to US capital. Then show how the equilibrium amount of labor migration would affect the income of these groups, including the migrants, and how this migration would affect efficiency.
 - Using a labor allocation graph, explain what would happen if migration was illegal but free trade in goods was allowed, and show how this affect the demand for labor in the two countries.
4. (20%) Assume that Iran produces two goods, oil and food, with two factors, labor and natural resources. Assume for simplicity that its economy is perfectly competitive. Relative to its trading partners, Iran is abundant in natural resources. Oil is natural-resource-intensive, while food is labor-intensive.
- Using a PPF and indifference curves, with oil on the horizontal axis, show Iran's free trade equilibrium.
 - Suppose Iran suddenly discovers a significant deposit of natural resources in the Persian Gulf. Assuming Iran is too small to affect the terms of trade (P_O/P_A), what will happen to Iran's production of oil and food? What would happen to its volume of trade and its overall welfare? Show this effect on a PPF diagram.
 - Suppose instead that Iran is a large country, in terms of its ability to affect the terms of trade. Could this growth be immiserizing? If no, why not? If yes, what other conditions would be necessary? If possible, show this on your PPF diagram.
 - Assuming that Iran is a large country, how would this growth affect its relative wage for labor, relative to the rents for natural resources? How would its trading partners be affected?
5. (10%) Suppose that Saudi Arabia exports oil and imports food, but its oil industry is run by a monopoly.
- Assuming that Saudi Arabia is too small to affect the terms of trade, compare the competitive equilibrium with the monopoly equilibrium. Which leads to more trade and higher welfare for Saudi Arabia?
 - Assume instead that Saudi Arabia can have a very large effect on its terms of trade. Is it possible that the monopoly can benefit Saudi Arabia in spite of its inefficiency? Show this. How does this affect its trade partners?
6. (15%) Give and graph the PP and CC equations for the Krugman-Obstfeldt model of monopolistic competition, and briefly explain them. Use this model to explain how competition between the US and Japan in the automobile industry affects prices, the number and size of firms, and consumer welfare in both countries. Assume that the US has a market size twice that of Japan but technologies, factor prices, and market conditions are otherwise similar. Show each country's autarky equilibrium, and then explain the effects of opening up free trade in both the short and long run. How would your answer differ if the US firms had significantly higher fixed costs?

10% BONUS: Consider three regions, North America, Europe, and China. Assume North America's GDP is \$15 trillion, Europe's is \$12 trillion, and China's is \$2 trillion. The average distance from North America to Europe is 5000 miles, from North America to China is 8000 miles, and from Europe to China is 9000 miles. Assume the gravity equation for exports is:

$$X_{ij} = 8 \sqrt{\frac{Y_i Y_j}{D_{ij}}}$$

where Y_i is the GDP of country i (in trillions of comparable dollars), D_{ij} is the average distance in miles between country i and country j , and X_{ij} is the amount of exports from country i to country j . Draw a 3 by 3 matrix, and fill in the total predicted trade between each country (assume a region has no international trade with itself). Give your answers in billions (i.e., three decimal places for a trillion). Add up the total predicted exports for each region. What is the export ratio for each country, and where is it highest? Why?