

Answer all of the following questions. Use graphs where requested, and be sure to clearly label them and briefly explain them. Neatness and organization can affect your grade! You may use the book or notes, but you must work alone!

1. (25%) Consider two countries, China and the USA, each producing two goods, food (F) and cloth (C), with only one resource, labor, constant returns to scale, and perfect competition. Assume that China has 800 (million) identical workers, and one worker can produce either one units of F or five units of C, while the USA has only 200 (million) workers, and one worker there can produce either 20 units of F or 25 units of C.

- a) In two separate diagrams, graph the PPFs for both China and the USA, putting food on the horizontal axis. What is the autarky relative price ratio (P_F/P_C) in each country?
- b) Assume that each country allocates 75% of its labor to food at its autarky equilibrium. For each country, what is the utility-maximizing autarky production combination of F and C? Show these combinations on your PPF graphs using indifference curves, and label them (A) for autarky.
- c) Which country has the comparative advantage in which good? What does the Ricardian Theorem predict would be the pattern of free trade? Which country will have the higher income, and why?
- d) Prove that in this example, total production of F and C increases when each country specializes in its comparative advantage. At what values of the terms of trade (P_F/P_C) would each country be willing to specialize in its comparative advantage?
- e) Assume each country fully specializes, and trades 1000 units of food for 3000 units of cloth. What is the equilibrium terms of trade (P_F/P_C) this implies? How much F and C will each country consume? Show these new trade equilibria on your PPF diagrams, labeling the new production points (Q), the consumption points (C), and the consumption possibility frontier (CPF). How has trade affected each country's welfare?

2. (25%) Consider a model of trade between the USA and Europe, in which the only resources are labor (L) and capital (K). The USA has 200 million identical workers, and \$30 trillion worth of generic capital stock. Europe has 250 million identical workers, and \$20 trillion worth of capital stock. Each country produces only producer goods (X) and consumer goods (Y) under perfect competition, and each sector uses both L and K with constant returns to scale and diminishing marginal returns, since L and K are not perfect substitutes. Producer goods are relatively capital-intensive. Assume factor productivity and consumer preferences are internationally identical.

- a) Based on this information, which country is abundant in which factor?
- b) In two separate diagrams, graph the PPFs for both countries, with X on the horizontal axis, and use indifference curves to show the autarky equilibria. How does the relative autarky price (P_X/P_Y) differ internationally?
- c) Under perfect free trade between the two countries, what would the Heckscher-Ohlin theorem predict would be the pattern of trade?
- d) How would free trade affect the output price ratio (P_X/P_Y) and the wage-rental ratio (W/R) in each country?
- e) On your PPF diagrams, show the free trade equilibria.
- f) How would your answers in (a), (b), and (c) be different if labor in the USA was twice as productive as labor in Europe? Would the price ratio (P_X/P_Y) and/or the relative wage (W/R) still converge?
- g) How might your answers in (a), (b), and (c) be different if, instead, both the USA and Europe has a strong consumption bias towards the good in their comparative advantage?

3. (20%) Consider the potential effects of a small European country joining the EU on the country's general welfare, and on the welfare of different groups inside it. Assume the country has only two factors, L (an abundant factor) and K (a scarce factor), and produces two tradeable goods, which you can call Q_X (an exportable good that is intensive in the country's abundant factor) and Q_I (an importable good that is intensive in the country's scarce factor). Of course, you may assume that its autarky price ratio (P_X/P_I) is significantly lower than in the EU. Assume that the economy is perfectly competitive, has full employment, and that all other Heckscher-Ohlin assumptions apply, except that: (i) in the short-run, neither L nor K is able to move between sectors; (ii) in the medium-run, L moves to the sector paying the highest wage while K remains fixed and specific to each sector; and (iii) in the long-run, both L and K are fully mobile across sectors.

- a) Using a PPF diagram, show its autarky equilibrium, and then show how specialization and free trade allows it to reach higher indifference curves, in (i) the short-run, (ii) the medium run, and (iii) the long run.
- b) Using a labor allocation graph, show how free trade would affect the wage and rental rates in each industry, in (i) the short-run and (ii) the medium-run. How would the wage-rental rate change, relative to autarky, in (iii) the long-run?

4. (15%) Suppose that Iran exports oil and imports food, but its oil industry is run by a monopoly, and there are no externalities from oil consumption or production.

- a) Assuming that Iran is too small to affect the terms of trade, compare the competitive equilibrium with the monopoly equilibrium, using its PPF and indifference curves, with oil on its horizontal axis. Which leads to more trade and higher welfare for Iran?
- b) Assume instead that Iran can have a very large effect on its terms of trade. Comparing the competitive with the monopolistic equilibrium, explain and show how the monopoly could benefit Iran in spite of its inefficiency. Show this. How would the monopoly affect Iran's trading partners?
- c) If another country with a comparative disadvantage in oil also has a monopoly in its oil industry, how would opening up to free trade affect the country's overall welfare?

5. (10%) Assume that Germany and Japan both have many producers of automobiles, with free entry and exit, but product differences, brand-name recognition, and economies of scale keep the two markets from being perfectly competitive. Assume that German and Japanese producers have similar cost structures, but that Japan is a larger auto market.

- a) Explain how the number of firms in this case of monopolistic competition would affect the price of the product. Explain how the number of firms and the size of the overall market would affect the average cost of production. Explain how free entry and exit would affect producer profits in the long-run.
- b) How would Germany and Japan differ, under autarky, in the number of firms and the price of autos? How would free trade in autos between them affect the price of autos in each, in the short-run? How would this in turn affect the size and number of firms, and what would happen to price in the long-run, as well as number of brands available to German and Japanese consumers? Show your predictions using the Krugman-Obstfeld monopolistic competition pricing and cost (PP-CC) diagram.

6. (5%) What is the gravity model, and what does it predict? Ceteris paribus, how should the size of a country affect its trade ratio?

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