Econ 27000 International Economics
Winter 2021
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Mid-Term Exam

Instructions: You have 80 minutes to answer all the questions. The total number of points is 80, so the number of points per question also indicates how much time you should devote to that question.

Make sure your answers are legible and concise. Make assumptions if you need to and make sure to explain the intuition behind your results. If you get stuck with the math in the theoretical exercise, try to guess the answers to the remaining questions providing intuition.

I. Short Questions (25 points)

Determine whether the following statements are TRUE, FALSE or UNCERTAIN, and justify your answer in one paragraph (one sentence could be enough). Grading will be based on the justification (not on the simple TRUE, FALSE, UNCERTAIN answer). Please be concise.

1. The representative consumer always gains from trade. **(5 points)**

   False. With economies of scale, a country may be worse off by opening up to trade (slides 23–24 of `4_Increasing_returns`).

2. A firm exhibits internal scale economies if it has a fixed cost and constant marginal costs. **(5 points)**

   True. Average cost is falling.

3. In the specific-factors model, population growth (i.e., growth in the mobile factor) hurts all three factors. **(5 points)**

   False. Wages will fall, but the rental rates of the other factors should increase because their marginal products are increasing in labor.

4. In a two-country model of trade, world relative prices must always fall between the pair of autarky relative prices. **(5 points)**

   False. With external economies of scale, trade can reduce prices everywhere because the supply curve is forward-falling (slides 20–21 of `4_Increasing_returns`).

5. In a specific-factors model with Cobb-Douglas preferences $D_C^{1/2} D_F^{1/2}$, an exogenous 10% increase in the relative price of cloth leads to an increase in real wages. **(5 points)**

Uncertain. This is still not enough information. To get full credit, it would be enough to point out that the answer depends on the elasticity of demand for labor in the food sector, too. In particular, if labor demand in the food sector is inelastic enough, then the wage will increase enough to offset the price increase and make real wages increase (slide 32 of `5_Specific_Factors_Model`). The following is not expected of students, but it's helpful: With these preferences, real wages should be measured as $w/(p_C^{1/2}p_F^{1/2})$. An exogenous 10% increase in p_C (with p_F held fixed) must yield at least a 4.9% increase in the nominal wage w for the real wage to increase.

II. Short Question (10 points)

You are asked to provide economic advice to the U.S. administration regarding the following economic policy proposals.

- *"The solar panel industry in the United States is currently not able to compete with the international competition. We should put import barriers on solar panels. When US firms are able to compete, we can re-open the imports of solar panels."*

1. Using the concepts presented in this class, describe the economic rational for this proposal. Be concise: one paragraph answers only please. **(5 points)**
   - **Solution:** It is sufficient to talk about (dynamic) economies of scale and mention "infant industry" argument. When the solar panel industry features dynamics IRS, protecting the industry until it reaches high enough cumulative outputs might be justified. See Slide 26 of '4_Increasing_return" for more detail.
2. Next, list three relevant concerns with this proposal. Again, please be concise. **(5 points)**
   - **Solution:** According to Slide 27:
     "When considering whether a government should subsidize high-technology industries, should consider:
     (a) The ability of government to subsidize the right activity
     (b) Instead of subsidizing specific industries, it may be better to subsidize research and development through the tax code
     (c) The economic importance of externalities (measurable?)
     (d) Externalities may occur across countries as well (free-riding)

III. Theoretical exercise (25 points)

Consider a world with 2 countries, US and Mexico, and two goods, cars (C) and food (F). Both goods are produced using both capital and labor. Suppose the production function

for cars and food in the US is: $C = 3\min(L, K)$ and $F = 5\min(L, K)$. There are 50 units of both capital and labor in the US. The production function for both goods in Mexico is: $C = \min(\frac{1}{5}L, K)$ and $F = \min(\frac{1}{5}L, K)$. There are 500 units of labor and 100 units of capital in Mexico.

The utility function is the same in both countries: $U(C, F) = C^{\frac{1}{3}}F^{\frac{2}{3}}$.

1. Which country has an absolute advantage in each good? Which country has a comparative advantage in each good? **(5 points)**

   Solution. The US has an **absolute advantage** in both goods: It requires only $(L, K) = (1/3, 1/3)$ and $(L, K) = (1/5, 1/5)$ to make one unit of cars and food, respectively, in the US, while it requires $(L, K) = (5, 1)$ to make one unit of either good in Mexico. The US has a **comparative advantage** in food; Mexico, in cars. To see this, note that the opportunity cost of one car in Mexico is one unit of food, while in the US it is 5/3 units of food.

2. Draw the world relative supply curve of cars and food with Q_F/Q_C on the horizontal axis and P_F/P_C on the vertical axis. **(5 points)**

   Solution. Notice that labor and capital will be used in the same fixed proportion across both goods. Notice, too, that the endowments in either country reflect exactly the fixed proportion used in production. In the US, one unit of capital will always be used alongside exactly one unit of labor to produce either food or cars, and there are equal endowments of both factors. Similarly, in Mexico, one unit of capital will always be used alongside exactly five units of labor to produce either food or cars, and the endowment of labor is five times that of capital. Accordingly, we can think of this as the Ricardian model with a composite factor in each country. The US is endowed with 50 units of its composite factor; Mexico, with 100 units of its own.

   Relative supply will look as it would in the Ricardian model. There will be a flat region at $P_F/P_C = a_F/a_C = 3/5$ until the relative quantity $Q_F/Q_C = (N/a_F)/(N^*/a_C^*) = (50/(1/5))/(100/1) = 2.5$, at which relative supply is a vertical line up to $P_F/P_C = a_F^*/a_C^* = 1$, after which the supply curve becomes flat again.

3. What is the world relative demand curve for cars and food? Draw the world relative demand curve on the same graph as the world relative supply curve. **(5 points)**

   Solution. Preferences in both countries are Cobb-Douglas: $U(C, F) = C^{\frac{1}{3}}F^{\frac{2}{3}}$. It follows that

   $$\frac{Q_F}{Q_C} = \frac{(2/3)E/P_F}{(1/3)E/P_C} = 2\frac{P_C}{P_F}$$

   or, equivalently,

   $$\frac{P_F}{P_C} = \frac{2}{(Q_F/Q_C)}.$$

4. Under free trade what is the equilibrium price of food relative to cars P_F/P_C? How many units of cars and food do the US consumers consume under free trade? **(5 points)**

   Solution. Evaluate the relative demand curve at $Q_F/Q_C = 2.5$ to get $P_F/P_C = 4/5$. Notice that this is also a point on the relative supply curve, so this must be our equilibrium point. Relative prices under free trade are $P_F/P_C = 4/5$. This equilibrium will feature complete specialization, with the US making only food and Mexico making only cars. Total world production of food is 250 units; of cars, 100 units. Let's normalize $P_C \equiv 1$, so $P_F = 4/5$. Then total income in the US is $250 \times (4/5) = 200$. It follows that

$$Q_F^{US} = \frac{2}{3}\frac{E}{P_F} = \frac{2}{3}\frac{200}{4/5} = \frac{500}{3}$$
$$Q_C^{US} = \frac{1}{3}\frac{E}{P_C} = \frac{1}{3}\frac{200}{1} = \frac{200}{3}.$$

5. What are the welfare effects from trade on US consumers? Hint: Compare consumption under free trade with consumption under autarky. **(5 points)**

   Solution. Under autarky, $P_F/P_C = 3/5$ and therefore $Q_F/Q_C = 10/3$. It follows that 100/3 units of capital and labor are allocated to food to produce $Q_F = 500/3$ and 50/3 units are allocated to cars to produce $Q_C = 50 < \frac{200}{3}$. So US consumers gain from trade because they consume more cars and the same amount of food under free trade than they would under autarky.

IV. Theoretical exercise (20 points)

Elon Musk and Akio Toyoda are stranded on a desert island. There are only two goods on the island: Teslas (T) and Toyotas (Y). Elon and Akio have the same Cobb-Douglas preferences $U(T, Y) = T^{1/5}Y^{4/5}$. They have different endowments of the goods. Elon owns 10 Teslas and 0 Toyotas, and Akio owns 10 Toyotas and 0 Teslas. Both Elon and Akio take prices as given.

1. What is the price of Teslas relative to Toyotas under autarky? **(5 points)**

   Solution. In an endowment model, relative quantities must equal relative endowments, so $Q_T/Q_Y = E_T/E_Y = 10/10 = 1$. Relative demand is given by

$$\frac{P_T}{P_Y} = \frac{1}{4(Q_T/Q_Y)}.$$

   It follows that $P_T/P_Y = 1/4$.

2. Suppose one morning they discover the rest of the world which is endowned with 10 Teslas and 90 Toyotas. If they can costlessly trade with the rest of the world (which has the same preferences), what will be the world price of Teslas and Toyotas? **(5 points)**

   Solution. Now the total world endowment is $(E_T, E_Y) = (20, 100)$. So world prices must be

$$\frac{P_T}{P_Y} = \frac{1}{4(E_T/E_Y)} = \frac{100}{80} = \frac{5}{4}.$$

3. Are there aggregate gains from trade on the island? **(5 points)**

   Solution. Yes, there are aggregate gains from trade on the island. This is a neoclassical endowment model, so it's sufficient to note that world prices differ from autarky prices.

4. Is Elon gaining from trade with the rest of the world? **(5 points)**

   Solution. Yes, because the relative price of Teslas rose from its level in autarky. He must pay this higher price to buy his own Teslas, but that cost is more than offset by the increased value of his endowment. Formally, normalize $P_Y = 1$ in what follows, and note that the value of Elon's endowment under free trade is then $50/4$. He consumes

$$Q_T^{Elon} = \frac{(1/5)(50/4)}{(5/4)} = 2$$
$$Q_Y^{Elon} = \frac{(4/5)(50/4)}{(1)} = 10.$$

   Under autarky, on the other hand, the value of his endowment is just $5/2$, so he consumes

$$Q_T^{Elon} = \frac{(1/5)(5/2)}{(1/4)} = 2$$
$$Q_Y^{Elon} = \frac{(4/5)(5/2)}{(1)} = 2.$$