

# Fall 2018 14.01 Problem Set 9

## Problem 1: True or False (20 points)

Determine whether the following statements are True or False. Explain your answer.

1. (5 points) Suppose the cost of making a car is cheapest in Japan. Then Japan should specialize in producing cars.
2. (5 points) In order for an IRA to encourage savings (relative to a regular savings account), the substitution effect of higher interest rates must dominate the income effect.
3. (5 points) An index fund is a portfolio of stocks that tracks a broader index such as the Dow Jones Industrial Average or the S&P 500. Investing in an index fund is better than investing in the stock of an individual company because the index fund always has higher returns.
4. (5 points) Consider the effect of interest rates on consumption today. Increasing interest rates always has a negative substitution effect (decreases consumption today) and a positive income effect (increases consumption today)

## Problem 2: Trade and Production Possibilities Frontier (20 points)

Consider the production of wine and cheese in France and Spain. This table gives the number of necessary hours to produce each (labor is the only input):

	France	Spain
1 Kilo of Cheese	4	6
1 Bottle of wine	6	12

1. (5 points) For each good, which country has an absolute advantage? For each good, which country has a comparative advantage? (5 points)
2. (5 points) Is it in Spain's interest to develop trade relationships with France? Is it in France's interest to trade with Spain? Is France more competitive at producing both goods?
3. (5 points) Suppose that France and Spain are under autarky (no trade). Draw the production possibility frontier for each country for the number of goods they can produce in one day (24 hours, one worker).
4. (5 points) France and Spain decide to trade and suppose they agree to trade one bottle of wine for  $k$  kilos of cheese. What values of  $k$  would make both France and Spain strictly better off under trade? Draw the new consumption set for each country under trade. How has it changed and why?

### **Problem 3: International Trade I : Differences in Technology (15 points)**

Suppose there are only two goods in the world: tea and coffee. In both the US one pound of tea requires 3 hours of labor to produce and one pound of coffee requires 2 hours of labor to produce. A worker can choose to work either in the tea industry or in the coffee industry (skills are completely transferable across industries) and consider the case when the labor market is perfectly competitive, and the market for tea and coffee are also perfectly competitive.

1. (5 points) What is the ratio of the price of tea to the price of coffee?
2. (5 points) Suppose that on the international market, due to the different production functions by different countries, we can trade  $k$  pounds of tea for 1 pound of coffee. For what values of  $k$  will the US choose to export tea? For what values of  $k$  will the US choose to export coffee?
3. (5 points) For what values of  $k$  will the US be strictly better off under trade than under autarky? Why?

## Problem 4: International Trade II: Differences in Factor Abundance (45 points)

Suppose that there are only two products, computers and automobiles. Automobiles are more labor-intensive (requires relatively more labor) and are produced according to the production function

$$F^A(K, L) = K^{\frac{1}{3}}L^{\frac{2}{3}}.$$

Computers are more capital intensive (require relatively more capital) and are produced according to the function

$$F^C(K, L) = K^{\frac{2}{3}}L^{\frac{1}{3}}$$

Suppose that both labor and capital are perfectly mobile across the two industries. That is, workers and capital can switch fluidly from producing computers to producing cars and vice versa. For this problem, assume everything is in perfect competition.

1. (5 points) If labor and capital are perfectly mobile across the two industries, what must be true about wages and the price of capital in the two industries? That is, if  $w_A$  and  $w_C$  are the wages per unit of labor paid to workers in the automobile and computer industries respectively, what can we say about  $w_A$  and  $w_C$ ? Likewise, if  $r_A$  and  $r_C$  are the price of capital in the two industries, what must be true about  $r_A$  and  $r_C$ ?
2. (10 points) Suppose that the United States has 30 units of labor total and 240 units of capital, and all labor and capital is utilized for production. The price of automobiles is  $p_A = 200$  while the price of computers are  $p_C = 100$  under autarky. How much labor and capital is used for the production of automobiles under autarky? How much labor and capital is used to produce computers under autarky? (*Hint: Use the condition on wages and prices of capital you found in the previous exercise. In perfectly competitive labor and capital markets, what is the relationship between wages (or price of capital), the production function, and the price of the output goods?*)
3. (2 points) How many cars and computers does the US produce?
4. (3 points) What is the wage and price of capital in the US under autarky?
5. (5 points) Assume that China has the same production function, but the price of automobiles is 100 and the price of computers is 200. China has 240 units of labor available and 30 units of capital. If all available labor and capital are used in production, how much labor and capital is used in each sector?

6. (2 points) How many cars and computers does China produce?
7. (3 points) What is the wage and price of capital in China under autarky?
8. (5 points) Why are wages and the price of capital different across the US and China?
9. (10 points) Suppose that the two countries open up to trade and the new equilibrium world price of automobiles is 150 and the world price for computers is also 150.
  - (a) Is it still the case that both countries produce positive amounts of both goods? (*Hint: The condition you found in part 1 of this problem assumes that the countries produce a positive amount of both goods. Assume this condition holds and solve for the optimal capital and labor in each sector in US and China. Does this lead to any contradictions or impossibilities?*)
  - (b) What happens to the wages and the price of capital in the two countries? What happens to the total units produced in the two countries? Explain why this has happened.

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