

International Trade

Final Exam

Take home exam

Caution: In this take home final exam, you must work by yourself to solve the question of this take home exam. You are not allowed to discuss the questions and the answers of this take home exam with your friends or classmates. When it is found that a student did not solve the questions by himself/herself, I report it to the department chair as "Cheating". As you know, cheating is heavily penalized in the University rule. A student who cheats is penalized by a three months suspension from the university and a one year delay of graduation from the university.

Instruction 1: Answer all questions in this take home exam. For answering these questions, you need to show the process for reaching your answer. Since your answer will include a lot of math and graphs, you do not need to use a word processor to answer those questions. A handwritten answer is fine. You can answer the questions in either English or Japanese.

Instruction 2: When you submit your answer, please attach the answer of the reading assignment. Note that your answer of the reading assignment should be typed.

Instruction 3: The due date of this take-home exam is the same as the due date of the reading assignment. The due date is December 20th, 4:00PM. As I stated in instruction 2, attach the answer of the reading assignment to the last page of your answer of this take-home exam and submit them together. The submission place is the third cluster office of 3A building 2nd floor.

Instruction 4: You need to put your name and student ID on your answer. If they are missing, your answer will not be graded.

Instruction 5: Enjoy solving the questions and good luck!

1. Consider a fixed production coefficient H-O model that we studied in class. There are two countries. One country is home and the other country is foreign. Two goods are clothing and food. Two industries are clothing industry and food industry. Assume that in the clothing industry, 9 units of capital and one unit of labor are needed in order to produce one unit of clothing. In the food industry, assume that one unit of capital and 9 units of labor is needed. Assume that the technologies are the same in home country and foreign country. Factor endowments are different in two countries. Home country is capital abundant and foreign is labor abundant. More specifically, assume that the capital endowment and labor endowment of home are $K = 56$ and $L = 24$. For foreign country, assume that the factor endowment are $K^* = 24$ and $L^* = 56$. Assume that the utility function of people in home and foreign are the same and that it is $U(x_c, x_f) = \ln x_c + \ln x_f$. \ln is the natural log and its base is e . The derivative of $\ln x$ with respect to x is $\frac{1}{x}$. Since what matters is the relative price, we can take the food as numeraire and assume that p_f is one when you need to calculate some number. (This normalization does not matter.)
 - (a) From the utility maximization condition we have the $MRS = p_c/p_f$. By using this utility maximization condition, show that the relative demand curve is $x_c/x_f = \frac{1}{(p_c/p_f)}$. Then, draw the relative demand curve by measuring x_c/x_f on the horizontal axis and p_c/p_f on the vertical axis.

- (b) Draw the PPF of the home country by measuring Q_c on the horizontal axis and Q_f on the vertical axis.
- (c) In class we have learned that the production under the market mechanism can be calculated by maximizing the GDP subject to PPF. By using this method, draw the relative supply curve of home.
- (d) Assume that the home is a closed economy. Then, calculate the equilibrium relative price, p_c/p_f in home by calculating the intersection of the relative supply curve and the relative demand curve of home.
- (e) Calculate the rental rate of capital and the wage rate in the home when home is a closed economy by assuming that p_f is one. (You can assume that p_f is one since what matters in the market economy is only the relative price.
- (f) Calculate the $r/p_c, r/p_f, w/p_c, w/p_f$ by assuming that p_f is equal to one.
- (g) Calculate how much the clothing is produced. Calculate how much food is produced when home is a closed economy. In other word, calculate Q_c and Q_f .
- (h) In the closed economy, $Q_c = x_c$ and $Q_f = x_f$. Using the utility function, calculate the utility level of people in home. For calculating $\ln(x)$, use the excel.
- (i) Now, draw the PPF of foreign and the relative supply curve of foreign. When the relative prices are the same between home and foreign, show that foreign tends to produce more labor intensive goods. (This is the Rybczynski theorem.)
- (j) Assume that the foreign is also a closed economy. Find the equilibrium relative price, p_c^*/p_f^* , in the foreign. Also calculate the rental rate of capital and the wage rate by assuming that p_f^* is equal one. Which country have higher relative price of clothing when both countries are closed. Also, given your explanation intuitively so that even high school students can understand your explanation.
- (k) Now suppose that two countries are engaged in trade. Calculate the equilibrium world relative price.(hint, to find the equilibrium world relative price, first we need to find the world relative supply curve. The equilibrium world relative supply for a given price is $\frac{Q_c+Q_c^*}{Q_f+Q_f^*}$ for a given price).
- (l) Which goods the home export? Which goods the foreign export? Is there a relationship between factor abundance and the type of export?
- (m) Calculate the production of clothing and food in home at the equilibrium world relative price.
- (n) Note that the price of exported goods*(amount of export)=price of imported *(amount of import) in home from the trade balance condition. From this relationship, show that you have $p_c x_c + p_f x_f = p_c Q_c + p_f Q_f$ mathematically.
- (o) By using $p_c x_c + p_f x_f = p_c Q_c + p_f Q_f$ and the $MRS=p_c/p_f$, calculate x_c and x_f . (Hint: you know Q_c and Q_f already and $p_f = 1$ since p_f is numeraire)
- (p) Calculate the amount of import by calculating the difference of x_f and Q_f . Also calculate the export by calculating $Q_c - x_c$.
- (q) Calculate the production of foreign and the consumption of foreign for each goods.
- (r) Then, calculate the amount of export and the amount of import of foreign by calculating the difference of production and consumption for each goods.
- (s) From the answer in (k), show that the amount of export of home is actually equal to the amount of import of foreign.

- (t) By assuming that p_f is equal to one, calculating the $w/p_c, w/p_f, r/p_c$ and r/p_f of home when the home is engaged in trade. Now compare them with $w/p_c, w/p_f, r/p_c$ and r/p_f in the closed economy. Then show that $w/p_c, w/p_f$ will decrease and r/p_c and r/p_f will increase in home when the home open for trade. (This is the Stolper-Samuelson theorem.)
) Who will become better off after trade in home? Who will become worse off after trade in home? Explain your answer intuitively so that junior high school students can understand.
- (u) Calculate $w^*/p_c^*, w^*/p_f^*, r^*/p_c^*$ and r^*/p_f^* by assuming that p_f^* is equal to one. Show that factor price equalization theorem holds (that is, the factor prices are equalized in home and foreign).
- (v) Now we know that home will export clothing and import food. Now consider factor content of trade. That is we consider factor embodied in export and import. Let EX be the amount of export and IM be the amount of import of home. We can think that when home exports EX units of clothing, $EX \times 9$ units of capital and $EX \times 1$ units of labor are exported. Also when home imports IM units of food, $IM \times 9$ units of labor and $IM \times 1$ unit of capital are embodied and imported. This implies that we can think that the net export of capital through trade is $EX \times 9 - IM \times 1$. Also net import of labor through is $IM \times 9 - EX \times 1$. Let $\Delta K = EX \times 9 - IM \times 1$ and $\Delta L = IM \times 9 - EX \times 1$. Then, calculate ΔK and ΔL .
- (w) Assume that the home is a closed economy and is not engaged in international trade. But assume that factor endowment of home is changed by ΔK and ΔL . That is, we consider a situation that factor endowments change exactly by the amount of embodied trade. In other words, assume that the endowment of capital decreased by $|\Delta K|$ and the endowment of labor increased by $|\Delta L|$ in home and that home is a closed economy. Guess what will happen to $p_c/p_f, w$ and r in home by using the Rybczynski theorem and the Stolper Samuelson theorem. Also give your explanation intuitively so that even high school students can understand your explanation .
- (x) First draw the PPF in the situation explained in the above question in home. (That is, capital and labor changes by ΔK and ΔL and assume that home country is a closed economy.). Next, draw the relative supply curve. Third, then calculate the equilibrium relative price of p_c/p_f in home from the intersection of the relative demand curve and the relative supply curve by assuming that home is a closed economy. Also calculate the rental rate of capital and the wage rate assuming that $p_f = 1$. Show that your answer in this question coincide with the answer in the first part of question (r) (This is the reason that we can think that importing labor intensive goods in an open economy is equivalent to increasing labor endowment in a closed economy. Also exporting capital intensive goods in an open economy is equivalent to decreasing capital in a closed economy.)
2. Currently Japanese government is seriously considering the relaxation of immigration restriction and to accept more immigrants drastically. Now, let's analyze this policy issue in the H-O model. For simplicity, assume that Japanese economy is a small open economy. Assume that international price of p_c is equal to 1 and the international price of p_f is equal to one. The small open economy assumption implies that the domestic price of p_c is one and the domestic price of p_f is also equal to one. Assume that Japan produces only two types of goods. Two goods are clothing and food. Two industries are clothing industry and food industry. Assume that in the clothing industry, 9 units of capital and one unit of labor are needed in order to produce one unit of clothing. In the food industry, assume that one unit of capital

and 9 units of labor is needed. Assume that the initial endowment of capital in Japan is 20 and the initial endowment of labor is 10.

- (a) Calculate w and r in this economy. Also calculate how much clothing and food are produced.
 - (b) Now suppose that the Japanese government decides to accept a lot of immigrants from foreign countries. As a result, the labor in this country increases from 10 to 15. Calculate how r and w change.
 - (c) Is your answer in (b) consistent with some of the theorems that you learned in this class? Or is the answer inconsistent with the theorems that you learned in this class? If it is inconsistent with the theorems, which assumption of the theorem are not holding? Explain.
 - (d) When the amount of labor increases from 10 to 15, how much clothing is produced? How much food is produced? Calculate.
 - (e) Is the answer in (c) consistent with the theorem that you learned in the class?
3. First read the paper by David Card entitled "The Impact of the Mariel Boatlift on the Miami Labor Market" which is available on the classweb.
- (a) In this paper, what kind of economic relationship did the author want to examine?
 - (b) To examine such a relationship, what kind of the natural experiment did the author use?
 - (c) What is "Mariel Boatlift"?
 - (d) Why is it useful to use this natural experiment to study the effect of immigration? What did the author say?
 - (e) On page 24, the author states that although the unemployment rate in Miami increased from 5.0% to 7.1%, it cannot be solely to sudden arrival of immigrants. Why? Explain.
 - (f) In the last two column of Table 7, the author examine how the difference of wages of Cubans in Miami and other cities in the US. Why he want to look at such differences? Explain.
 - (g) When the author look at how the wage differences of Cubans in Miami and other cities move over time, what did he find?
 - (h) In the first two column of Table 6, the author looked at the difference of wages of black people in Miami and other cities. What did he find?
 - (i) What is the author's conclusion in this paper?
 - (j) Is this conclusion consistent with the theoretical prediction in question 2 in this take home exam.
4. Consider a specific factor model in a small open economy. Assume that the production function of the clothing sector is $Q_c = K_c^{0.5}L_c^{0.5}$ and $Q_f = K_f^{0.5}L_f^{0.5}$. The international price of one unit of clothing, p_c , is equal to 4 and the international price of one unit of food, p_f , is equal to one. K_c and K_f are specific capital used in clothing sector and food sector, respectively. L_c and L_f are the amount of labor used in clothing sector and food sector. The total amount of labor in this country is L . Assume that $L = 14$.

- (a) At the equilibrium, the marginal product of labor in clothing sector and the marginal product of labor in food sector should be the same. Calculate how much labor is used in clothing sector and food sector, respectively.
- (b) Calculate how much food and clothing is produced in this economy, respectively?
- (c) Assume that the price of food is one and the price of clothing is p_c . Calculate the relative supply curve Q_c/Q_f as the function of p_c . Show that it is an increasing function of p_c