NAME: _____

Student ID No.: _____

Economics 441
International Trade Theory
Prof. Alan Deardorff
Midterm Exam No. 2

November 5, 2008

INSTRUCTIONS

1. Please do not open the exam until you are told to do so.

2. **PLACE YOUR NAME AND STUDENT ID NO. ON THE EXAM.**

3. This exam has 60 points and you have approximately 80 minutes to complete the test.

4. Check that you have all 9 pages of the exam, including this cover sheet.

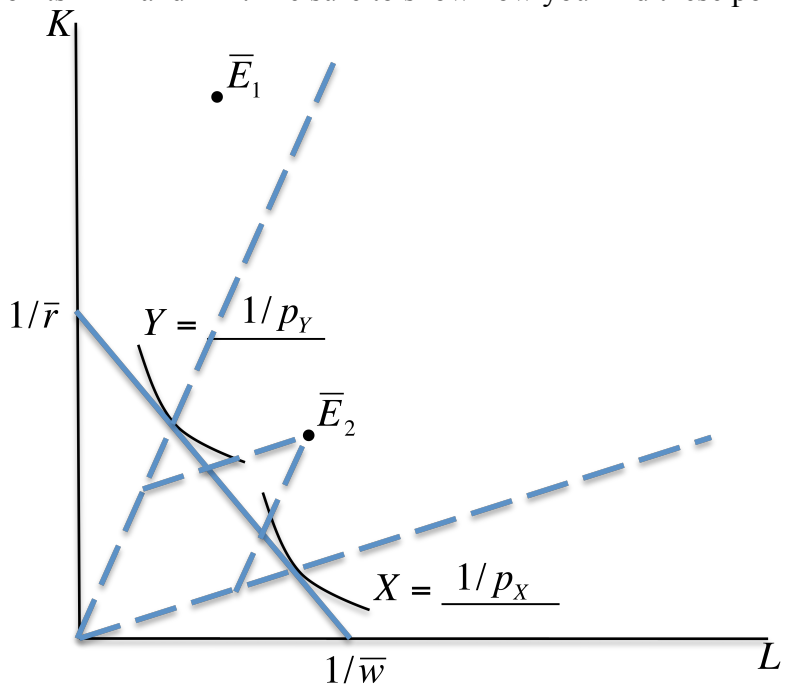
5. Answer all questions on these sheets.

6. Good luck!

1. (10 points) Consider a small open economy in the 2-sector Heckscher-Ohlin model facing world prices of goods X and Y, p_X and p_Y measured in dollars. Given those prices and the technologies for producing the two goods, the unit-value isoquants are those shown in the figure below. Also shown are two different possibilities for the factor endowments of the country, $\overline{E}_1$ and $\overline{E}_2$. Add to the diagram as necessary to answer the following.

   a. Fill in the two blanks in the figure to indicate the outputs of X and Y to which each of the unit-value isoquants corresponds.

   b. Find points on the two axes that represent amounts of labor and capital that would be worth one unit of value if the country were producing both goods, and label these points $1/\overline{w}$ and $1/\overline{r}$. Be sure to show how you find these points.



   c. If the country's factor endowments were given by the point $\overline{E}_1$,

      i. Would its output of X be worth more or less than \$1? *less (zero)*

      ii. Would its output of Y be worth more or less than \$1? *more*

      iii. Would its wage of labor be more or less than $\overline{w}$? *more*

   d. If the country's factor endowments were given by the point $\overline{E}_2$,

      i. Would its output of X be worth more or less than \$1? *less*

      ii. Would its output of Y be worth more or less than \$1? *less*

      iii. Would its national income be more or less than \$1? *more*

2. (7 points) Consider the 2-factor, 2-good, 2-country Heckscher-Ohlin Model with countries having identical and homothetic preferences. At any factor prices, production of good Y uses more capital per unit labor than good X.

Assume that at any relevant goods prices, the countries demand positive quantities of both goods. Also at any relevant factor prices, any industry that produces a positive output also demands a positive input of both factors. Finally, assume that the countries are engaged in free and frictionless trade (i.e., no tariffs or transport costs) and that there is positive trade and trade is balanced. Under these assumptions, identify the following statements as "necessarily true," "necessarily false," or "ambiguous" (i.e., may be either true or false depending on the situation).

a. If Country A has a larger quantity of capital than Country B, then Country A will export good Y.
   ____ necessarily true
   ____ necessarily false
   ✓ ambiguous

b. If Country A produces only good X and Country B produces only good Y, then the wage of labor is higher in Country A than in Country B.
   ____ necessarily true
   ✓ necessarily false
   ____ ambiguous

c. If both countries are producing both goods, then the rental price of capital is the same in Country B as it is in Country A.
   ✓ necessarily true
   ____ necessarily false
   ____ ambiguous

d. If an increase in demand for good Y in Country B causes its relative price to rise on the world market, then the real wage of labor in Country A will fall.
   ✓ necessarily true
   ____ necessarily false
   ____ ambiguous

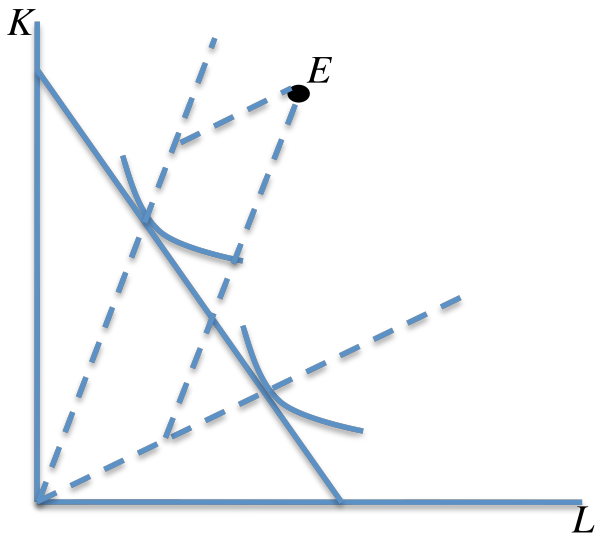
e. If Country A increases its endowment of both labor and capital by 10%, and if the world price changes as a result, then people in country A will be worse off.
   ✓ necessarily true
   ____ necessarily false
   ____ ambiguous

f. If Country A has exactly twice as much labor as Country B and exactly twice as much capital as B, then A will export good Y to B.
   ____ necessarily true
   ✓ necessarily false
   ____ ambiguous

g. If Country B is well endowed with capital relative to labor, compared to Country A, then the value of B's exports will be greater than the value of B's imports.
   ____ necessarily true
   ✓ necessarily false
   ____ ambiguous

3. (28 points) On this and the next few pages, draw the diagrams that we have used in class as requested. Be sure to label the diagrams so that we can tell that you know what you are doing. Then answer the questions that appear at the bottom of each page.

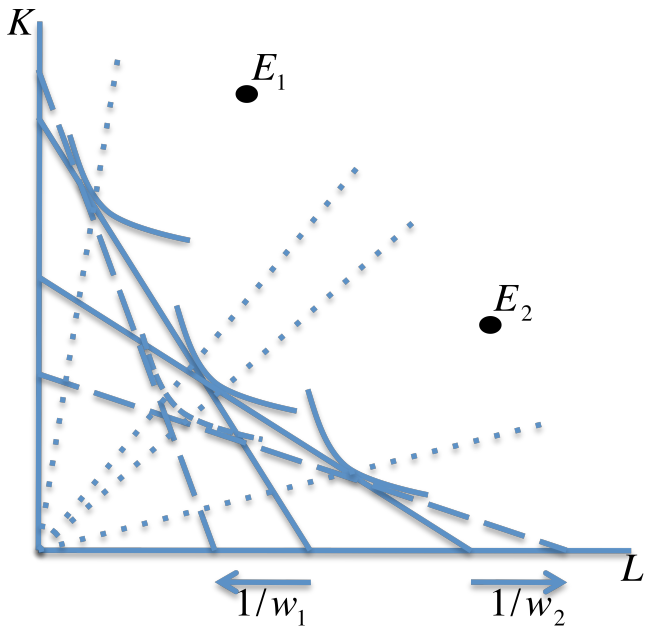
   a. Use the Lerner Diagram for the two-sector Heckscher-Ohlin Model to show an economy whose factor endowments cause it to produce positive amounts of both goods but clearly more of the capital-intensive good than of the labor-intensive good.



Which sector pays the higher wage?

Neither. Labor is perfectly mobile between the sectors, so labor is paid the same wage in both.

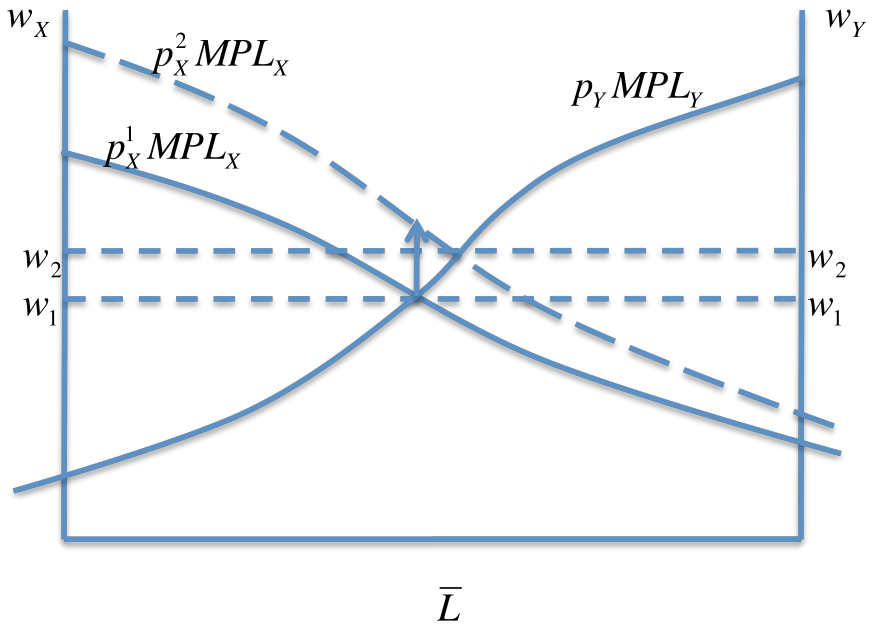
b. Use the Lerner Diagram for the three-good Heckscher-Ohlin Model with two cones of diversification to show the effects of a rise in the price of the good that two countries, in different cones, produce in common. (Hold the prices of the other two goods constant.)



How does this price change alter the nominal wages of labor in the two countries, if at all?

The wage rises in country 1, which is the capital-abundant country, and falls in country 2, the labor abundant country, as shown.

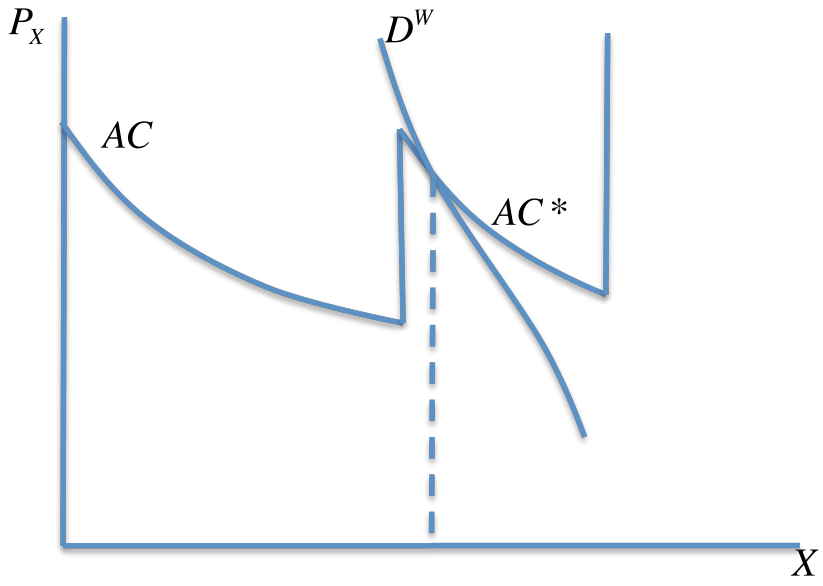
c. In the (standard) Specific Factors Model, show the effects of a rise in the price of one good, holding the price of the other good constant.



How does this price change alter the real wages of labor in the two industries, if at all?

Since labor is mobile between the sectors, the wage is the same in both. This wage rises in nominal terms, but less than the price of one good has gone up (shown by the arrow). Therefore the effect on the real wage (in both sectors) is ambiguous.

d. In the External Increasing Returns to Scale (EIRS) Model, with one good that has EIRS and another that has constant returns to scale, show the configuration of average costs and world demand for an equilibrium in which a large country produces only the EIRS good and a smaller country produces both goods.



Is it possible that the small country exports the EIRS good? Why?

No. The large country produces none of the <u>other</u> good and must therefore import it from the small country. With only two goods, the small country cannot export both.

4. (12 points) Consider a (home) firm that competes in a market selling a product, perhaps in competition with another (foreign) firm selling the same thing. The quantities that they sell are Q_1 and Q_2 respectively, the total of which, $Q = Q_1 + Q_2$, is sold to demanders whose quantity demanded is $D(p)$. The home firm's costs consist of a fixed cost, *F*, that does not depend on output, and a variable cost cQ_1, where *c* is the firm's constant marginal cost. The elasticity of demand in the market is denoted *e*, where

$$e = -\frac{p}{Q}\frac{dD(p)}{dp}$$

a. Show that, if the home firm maximizes profit taking the output of the foreign firm as given, then in equilibrium its markup, defined as $m = (p-c)/p$, will be the ratio of its market share, $s = Q_1/(Q_1 + Q_2)$, to this elasticity:

$$m = \frac{p-c}{p} = \frac{s}{e}$$

Profit is $\pi = pQ_1 - cQ_1 - F$ *which is maximized by setting its derivative with respect to* Q_1 *equal to zero, taking account of the dependence of price, p, on* $Q = Q_1 + Q_2$*:*

$$\begin{aligned}
\frac{d\pi}{dQ_1} &= (p-c) + Q_1\frac{dp}{dQ_1} \\
&= (p-c) + Q_1\frac{dp}{dQ}\frac{dQ}{dQ_1} \qquad (note: dQ/dQ_1 = 1) \\
&= (p-c) + Q_1\frac{p}{p}\frac{Q}{Q}\frac{dp}{dQ} \\
&= (p-c) - p\frac{Q_1}{Q}\left(-\frac{Q}{p}\frac{dp}{dQ}\right) \\
&= (p-c) - ps\frac{1}{e} = 0
\end{aligned}$$

Thus

$$p\left(1 - \frac{s}{e}\right) = c$$

or

$$m = \frac{p-c}{p} = 1 - \frac{c}{p} = 1 - \left(1 - \frac{s}{e}\right) = \frac{s}{e}$$

b. Using the result in part (a), what is the price charged by a monopolist whose marginal cost is \$12 and who faces a market demand elasticity of e=3?

A monopolist has market share of s=1, so in this case its markup is 1/3, or a price of \$18, since $(18-12)/18 = 1/3$.

c. Using the result in part (a), suppose that a domestic and a foreign firm, both with marginal cost c, compete in the domestic market. If trade is free (no tariffs or transport costs), what portion of the domestic market will be served by imports?

Because they sell the same product, they must charge the same price, and by assumption they have the same costs. Therefore their markups must also be the same. Charging the same price, they face the same (market) elasticity of demand, e, so they must also have the same market share. But that means they each have half the market, and therefore half of the domestic market is served by imports.

d. Continuing from the equilibrium in part (c), what will happen to that market share of imports if the cost of the domestic firm (only) rises to $c' > c$?

With higher cost and the same price, the domestic firm's markup must be smaller, and therefore its market share, s, must also be smaller. Therefore the market share of the foreign firm, and thus of imports, must rise.

5. (3 points) True/False/Explain: If the relative price of a good in a country in autarky is higher than the relative price of the same good on the world market, then it is <u>not</u> possible that the country will export that good under free trade.

False. This is exactly what happens if the domestic industry, in autarky, is a monopoly, and the world price is above the monopolist's cost but below its price.