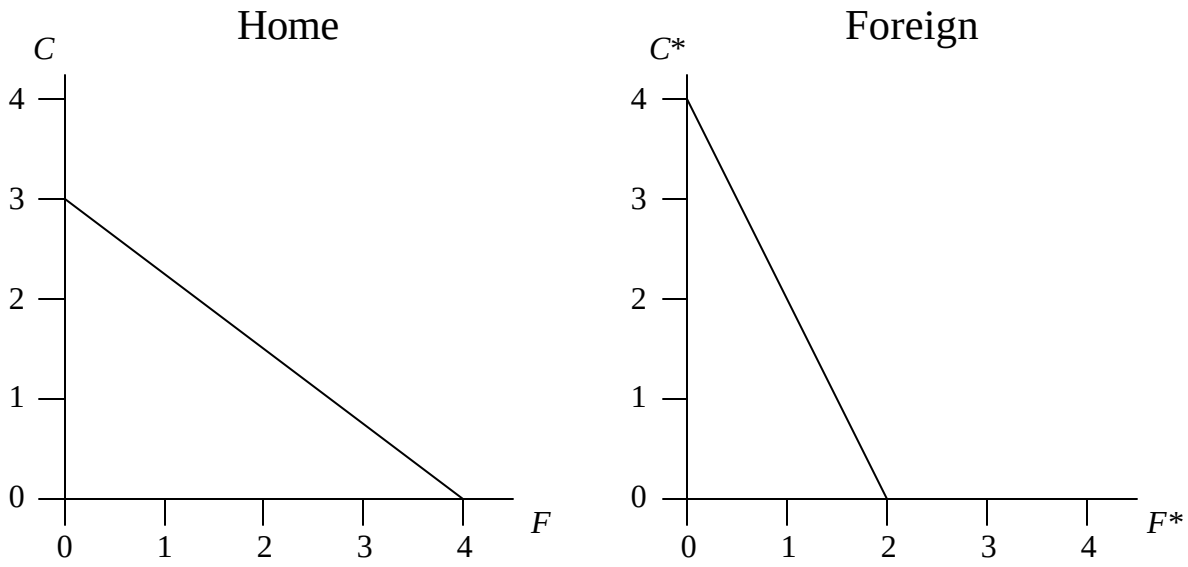
# Midterm Exam - *Answers*
# July 15, 2002

Answer all questions, in blue book. Plan ahead and budget your time. The questions are worth a total of 80 points, as indicated, and you will have 80 minutes to complete the exam.

1. [32 points] The graph below shows production possibility frontiers for two countries, Home and Foreign, producing two goods, Food and Cloth. Home is endowed with 120 units of labor, while Foreign has 160 units of labor.




   a. (4 points) What are the unit labor requirements of the two countries for producing the two goods, $a_{LF}$, $a_{LC}$, $a_{LF}$*, and $a_{LC}$*?

   *The intercepts of the PPFs are, for example, $L/a_{LF} = 4$ and thus*
   $a_{LF} = L/4 = 120/4 = 30$.
   *Similarly,*
   $a_{LC} = 120/3 = 40$;
   $a_{LF}^* = 160/2 = 80$;
   $a_{LC}^* = 160/4 = 40$.

   b. (4 points) Which country, if any, has an absolute advantage in Cloth? Which has absolute advantage in Food? Which has comparative advantage in Cloth? Which has comparative advantage in Food?

   *Neither country has an absolute advantage in Cloth, since $a_{LC}^*=40 = a_{LC}=40$.*

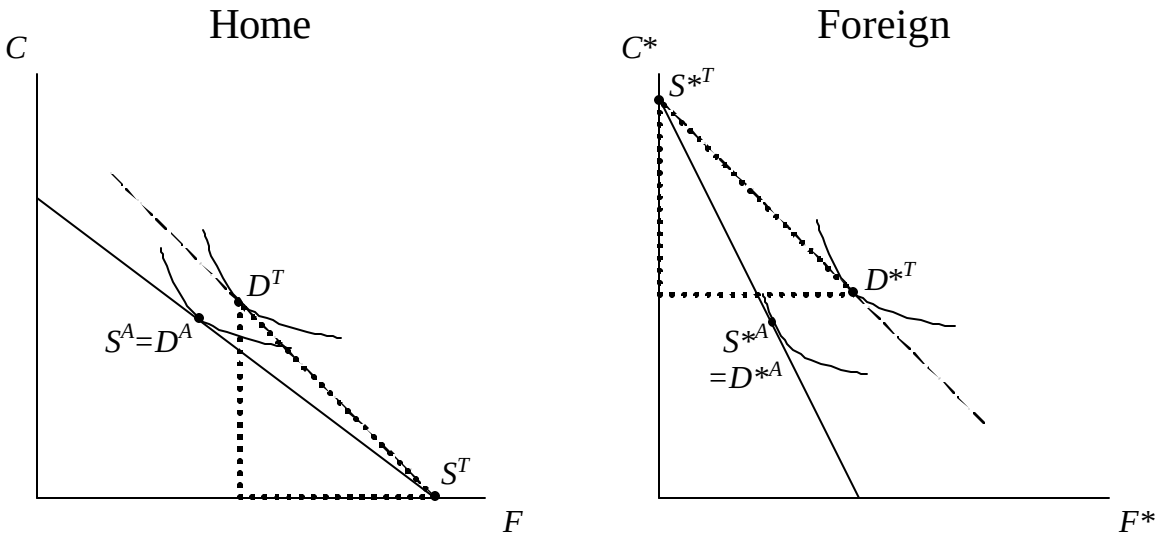
   *Home has an absolute advantage in Food, since $a_{LF}=30 < a_{LF}^*=80$.*

*Foreign has a comparative advantage in Cloth, since $a_{LC}^*/a_{LF}^* = 40/80 = 0.50 < a_{LC}/a_{LF} = 40/30 = 1.33$.*

*Home has a comparative advantage in Food, since $a_{LF}/a_{LC} = 30/40 = 0.75 < a_{LF}^*/a_{LC}^* = 80/40 = 2.00$*

c. (16 points) Copy the diagram to your blue book, making sure to keep approximately the proportions shown above, although you may omit the numbers. Then use the diagram as you've drawn it to illustrate, for plausible preferences, both autarky and free-trade equilibria for a world consisting only of these two countries. If there are quantities, distances, or slopes that should be equal in order for your diagram to represent equilibrium, be sure either that they look equal or that you say that they are. In your diagram, label the points where production takes place as $S^A$ and $S^{*A}$ for autarky in the Home and Foreign countries respectively, and $S^T$ and $S^{*T}$ for trade. Label the points where consumption takes place correspondingly as $D^A$, $D^{*A}$, $D^T$, and $D^{*T}$.

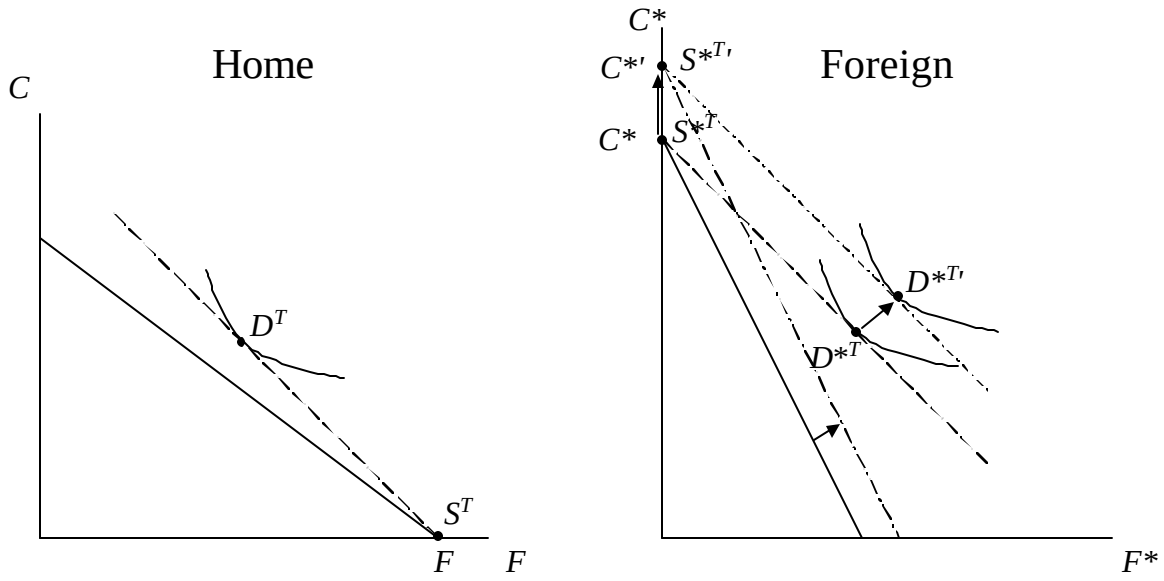
*The diagram should look something like the following:*



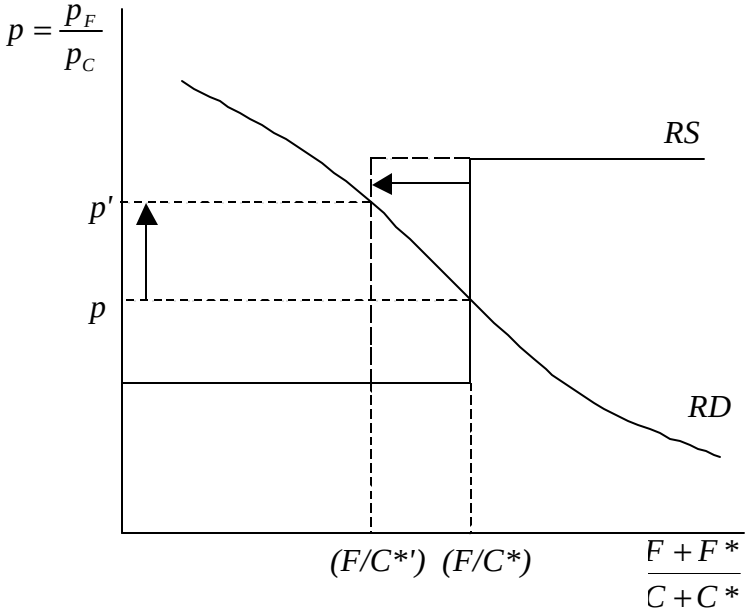

*Trade equilibrium requires that the countries face the same relative price, hence the same slope for the dashed price lines through $S^T$ and through $S^{*T}$, and also that the quantity of Food that Home exports equals the quantity of Food that Foreign imports, and vice versa for Cloth. All of this is assured if the two dotted trade triangles are identical in size and shape.*

d. (8 points) Suppose now that the Foreign labor force increases from 160 to 180. On a separate page (that is, don't try to add this to the diagram of part (c)), use whatever tools you need to work out how this will affect the world relative price of Food.

*Starting from a trade equilibrium like part (c), the PPF of Foreign shifts out as follows:*




*If prices were not to change, then Foreign's output would move from $S^{*T}$ to $S^{*T'}$, increasing its output of C only, while Foreign's demand would move from $D^{*T}$ to*

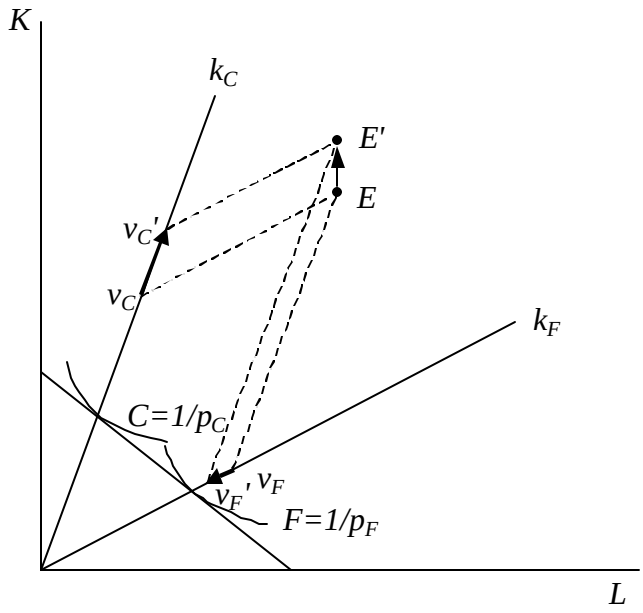



*$D^{*T'}$, increasing demand for both F and C. Thus, world relative demand for Food is unchanged, while world relative supply of Food is reduced (since only C* has increased). The world relative supply and demand curves now yield a higher equilibrium relative price of Food, as above.*

2. [27 points] Use the Heckscher-Ohlin Model to examine how capital accumulation in one country will affect the real rental price of capital in another. Specifically, use the tools of the HO Model with two factors (labor and capital), two goods (labor-intensive Food and capital-intensive Cloth), and two diversified countries (Cloth-exporting Home and Food-exporting Foreign) to do the following:

   a. Show, for given prices, how an increase in the Home country's capital stock will affect its relative supply of Food.

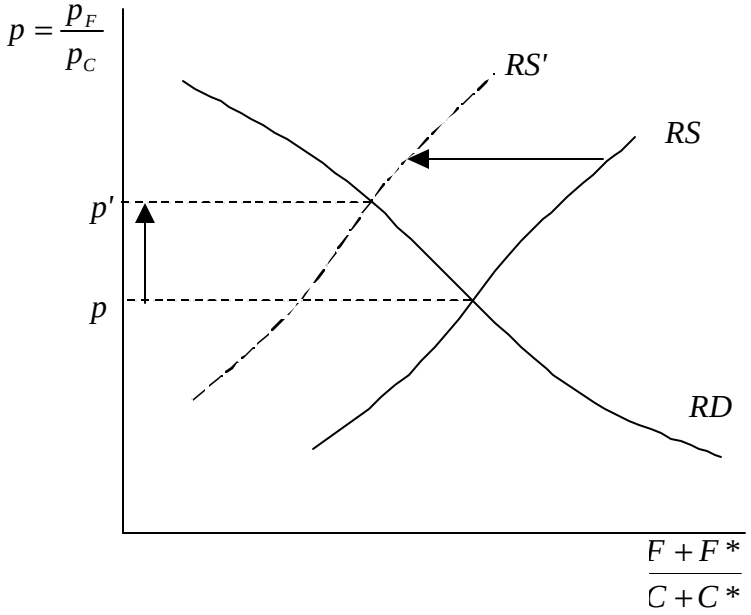
      *This is the Rybczynski Theorem, which shows as follows that a rise in Home's capital stock, at given prices, will cause it to increase its output of capital-intensive Cloth and reduce its output of labor-intensive Food:*




      *The country's relative supply of Food, F/C, goes down, since the numerator falls and the denominator rises.*

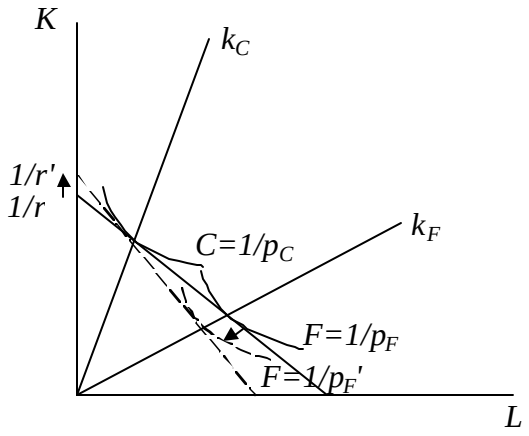
   b. Show how the change in relative supply of Food that you found in part (a) will affect the equilibrium world relative price of Food.

      *The decrease in relative supply of Food from the Home country reduces, at each price, the relative supply of Food to the world market, shifting the world relative supply curve to the left. With identical, homothetic preferences, the ratio of goods demanded at each price does not change, so this shift causes a rise in the equilibrium world relative price of Food, as shown below:*




c. Show how the change in world relative price of Food that you found in part (b) will affect the real rental price of capital in the Foreign country.

*The rise in relative price of Food can be represented as either a rise in the nominal price of Food with the price of Cloth fixed, or as a fall in the nominal price of Cloth with the price of Food fixed. Taking the first of these approaches, the unit-value isoquant for Food (in both countries, actually) shifts in toward the origin as follows:*



*From the vertical intercept of the new common tangent, the rental price of capital in both countries falls. This is a fall in the real rental, since neither goods price has fallen.*

3. [21 points] You are a worker (supplier of labor) in a relatively labor-intensive industry that is about to experience a 10% drop in price due to import competition. Based on the Heckscher-Ohlin and Specific Factors models, and assuming in all cases that the country produces and continues to produce both goods, determine under which of the following scenarios you will be *best off* in real terms, under which you will be *worst off*, and show why:

   a. Both labor and capital are immobile between industries.

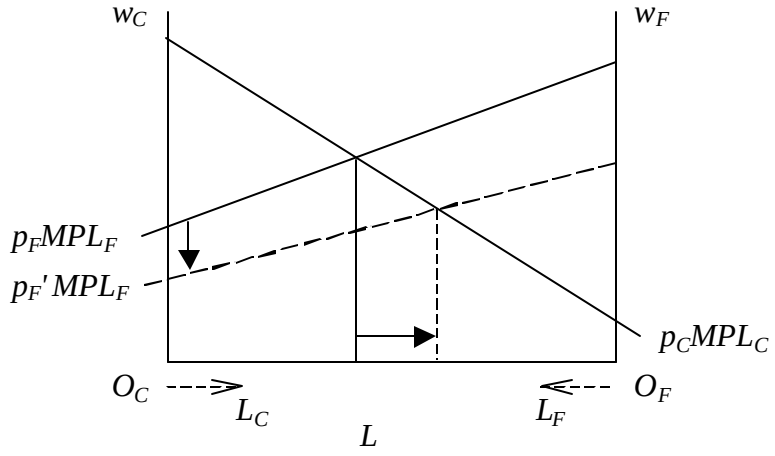
   b. Capital is immobile between industries, but labor is mobile.

   c. Both labor and capital are mobile.

   *Let the labor-intensive good be Food and the capital intensive good be Cloth, as usual. Then "you" are a worker in the food industry, facing a fall in the relative price of Food: ?($p_F/p_C$) < 0. Since food is produced, we must have $w_F=p_FMPL_F$. To determine the real wage, we need to look both at $w_F/p_F=MPL_F$ (what the wage will buy of Food), and at $w_F/p_C = (w_F/p_F)(p_F/p_C)$ (what the wage will buy of Cloth). Thus, whatever may happen to your wage in terms of Food, $w_F/p_F$, your wage in terms of Cloth will fall by 10% more than that. In comparing the three scenarios, therefore, we only need to look at what happens to $w_F/p_F=MPL_F$.*

   *If both factors are immobile between industries, then this is the extreme specific factors model, and employment of both labor and capital in the Food sector are both fixed. Therefore $MPL_F$, which depends only on the amounts of these factors, is unchanged. It follows that the wage in terms of Food is unchanged, while the wage in terms of Cloth falls by 10%.*

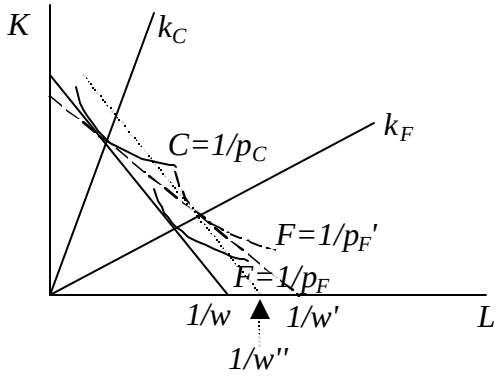
   *If capital is immobile between industries but labor is mobile, then this is the (standard) specific factors model. The capital stock in the Food industry is fixed, but labor may move in or out as necessary to equalize the wage between sectors. Using*



*the labor-market equilibrium diagram of the specific factors model, the fall in $p_F$ shifts the Food-industry labor-demand curve down, causing a fall in the nominal wage and a movement of labor out of the Food industry, as shown.*

*Since there is now less labor in the Food industry, but the same amount of capital as before, $MPL_F$ rises and the wage in units of Food is increased. The wage in units of Cloth therefore falls, but by less than 10% in this case, since the rise in $MPL_F$ offsets part of the fall in $p_F/p_C$. "You" are therefore better off in this case than when labor and capital were both immobile.*

*If both factors are mobile, then we are in the Heckscher-Ohlin Model, and the Stolper Samuelson Theorem applies. According to this theorem, a fall in the price of Food, since it is the labor-intensive sector, causes the wage in both sectors to fall relative to the prices of both food and cloth. This is worse for "you" than either of the other scenarios, since in them the wage in terms of Food either was constant or rose. To see this Stolper-Samuelson result, use the Lerner Diagram, holding the price of Cloth constant and lowering the price of Food so that the unit-value isoquant for Food shifts outward, as shown below.*




*We observe immediately, from the new common tangent's intercept with the L axis, that the nominal wage falls. To compare that fall with the fall in the price of Food, construct the dotted line parallel to the old isocost line but tangent to the new unit-value isoquant. This identifies a wage, w'', that is below the original w by the same 10% as the drop in $p_F$. Since $w' < w''$, $w/p_F$ has fallen.*

*To compare the three scenarios, then, we see that $w_F/p_F$ is unchanged in the extreme specific factors case, it rises in the standard specific factors case, and it falls in the Heckscher-Ohlin case. It is highest, therefore, in the standard specific factors case and lowest in the Heckscher-Ohlin case. Since $w_F/p_C$ falls by 10% relative to $w_F/p_F$ in each case, it too is highest in the standard specific factors case and lowest in the Heckscher-Ohlin case. The real wage of any employee in the Food sector is therefore also highest in the standard specific factors case (b) and lowest in the Heckscher-Ohlin case (c).*