Economics 101 — Spring 2006

International Trade

Problem Set 1

April 6, 2006

Due:	**Tue, April 25, 11:00am**
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1 Ricardian Trade Theory and Specialization

Home (no asterisk) and Foreign (asterisk) produce cheese and wine with the following unit labor requirements

	Home	Foreign
Cheese	$a_{LC} = 5$	$a^*_{LC} = 6$
Wine	$a_{LW} = 2$	$a^*_{LW} = 6$

Home and Foreign have total labor forces of $L = 100$ and $L^* = 200$ workers.

- *Production possibility frontiers.* Graph each country's production possibility frontier and calculate the opportunity costs of cheese in terms of wine. Which country has an absolute advantage in cheese production, which in wine production? Which country has a comparative advantage in cheese production, which in wine production?

- *Autarky.* Using the graph from your preceding answer, draw each country's consumption possibilities in the absence of trade. Calculate the relative prices of cheese in terms of wine in autarky.

- *Free trade.* Both countries open up to free trade. Graph the relative world supply of cheese $(Q^*_C + Q_C)/(Q^*_W + Q_W)$ and its response to the relative world price of cheese P_C/P_W based on the unit labor requirements. Provide specific values for changes to the regime of relative world supply on the axes.

  World consumers' demand for cheese relative to wine depends on the relative price of the two goods:

  $$(Q_C + Q^*_C)/(Q_W + Q^*_W) = 6 - 5 \cdot P_C/P_W.$$

  Graph the relative demand curve. Calculate the relative price P_C/P_W of cheese in world trade equilibrium. Calculate the production of Q_C, Q^*_C, Q_W, and Q^*_W and explain what this pattern of production states about the pattern of trade. Calculate the equilibrium wage rates w and w^* under free trade.

- *Free trade under reduced world demand.* What do countries trade if relative world demand changes to $(Q_C+Q^*_C)/(Q_W+Q^*_W) = 5-5\cdot P_C/P_W$? Do the countries trade if relative world demand changes to $(Q_C+Q^*_C)/(Q_W+Q^*_W) = 4-5\cdot P_C/P_W$? Comparing the consumption possibilities, show that both countries gain from trade when they trade.

- *Free factor movements and free trade.* Return to the world relative demand function $(Q_C+Q^*_C)/(Q_W+Q^*_W) = 6-5\cdot P_C/P_W$. Suppose there is international migration from Foreign to Home so that $L^{*\prime} = L^{\prime} = 150$. How does the pattern of production and trade in the world change? Why?

2 Ricardian Trade Theory and Wages

Home and Foreign invent different technologies to produce tools, beyond their production of cheese and wine. The table of unit labor requirements is:

	Home	Foreign
Tools	$a_{LT}=3$	$a^*_{LT}=6$
Wine	$a_{LW}=2$	$a^*_{LW}=3$
Cheese	$a_{LC}=5$	$a^*_{LC}=3$

- *Comparative advantage.* In which good does Home have the strongest comparative advantage? In which good does Home have the least comparative advantage?

- *Trade and wages.* If the relative wage rate $w/w^*=1$, in what goods will Home specialize? [*Hint*: You may neglect the relative size of the labor forces for your answer.]

- *Gains from trade.* Do both countries benefit from trade? Present an educated verbal argument.

- *Transport costs* (transfer question). If transport costs add 50% to the price of a good that is shipped from one country to another, how will goods be traded? Will all goods be traded? [*Hint*: Calculate of the total cost of each foreign good to a home consumer and compare it the the cost of the same good when produced at home; then calculate the total cost of a home good to a foreign consumer and compare it the the cost of the same good when produced abroad.]

3 Sector-Specific Factors and Trade

Home can produce machinery and flowers (in bundles of 1,000). The productions functions of the two industries and prices are

$$Q_M = \sqrt{K\cdot L_M} \quad \text{and} \quad Q_F = \sqrt{T\cdot L_F},$$

where K is capital, T is land, and L is labor. $P_M = P_F = 1$. Factor supply is $L_M + L_F = 100$ and $T = K = 100$.

- Derive the marginal products of labor $MPL_M(K/L_M)$ and $MPL_F(T/L_F)$ for the two industries.
- *Autarky wages.* Graph the labor demand curves in the machinery and flowers sectors, and calculate the equilibrium wage rate in autarky.
- *Trade pattern.* After opening up to free trade, Home faces a relative price of $P_M/P_F = 2$. How do the allocation of labor and wages change?
- *Production possibility frontier.* Using the general labor demand relationships for the two sectors, show that the production possibility frontier is
$$-MPL_F/MPL_M = -P_M/P_F$$
in labor market equilibrium.
- *Gains from trade.* Draw the production possibility frontier. How does the change in relative prices after trade affect production? Depict the gains from trade.

4 Heckscher-Ohlin Trade Theory and Endowments

At *current* goods and thus factor prices, cloth is produced *using* 20 hours of labor for each acre of land, while food is produced *using* only 5 hours of labor per acre of land.

- *Resource allocation.* The economy's total resources are 600 hours of labor and 60 acres of land. Use an Edgeworth box to determine the allocation of resources.
- *Endowment changes.* Labor supply increases from 600 to 900 to 1200 hours. Using the Edgeworth box, trace out the changing allocation of resources.
- *Extreme endowment changes.* What would happen if the labor supply increased beyond 1200 hours?

5 Heckscher-Ohlin Trade Theory and Wages

The relationship between the wage-rental rate ratio w/r and the relative price of cloth in terms of food P_C/P_F is
$$P_C/P_F = \sqrt{w/r}$$
in the Home economy. The optimal land-labor ratio choice is given by $T_F/L_F = 5 \cdot w/r$ in food production and by $T_C/L_C = \frac{1}{2} \cdot w/r$ in cloth production.

- *Factor price equalization.* Home opens up to free trade and experiences a doubling of the relative price of cloth. Use a goods-price-to-input-choice diagram to show how a doubling of the relative price of cloth affects wages and the choice of land-labor ratios in both sectors.

- *Resource allocation.* How can it happen that both sectors change land-labor ratios in the same direction, although total land and labor resources are given? [*Hint*: Describe the factor flows within the Home economy.]

- *Relative sector size.* Use an Edgeworth box to show the effect of a doubling in the relative price of cloth. [You may reuse the Edgeworth box from the preceding question for the initial state of the economy.]