Economics 101 — Fall 2003

International Trade

Problem Set 1

September 29, 2003

Due:	**Wed, October 15, 12:00pm**
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1 Ricardian Trade Theory and Specialization

Home and Foreign produce cheese and wine with the following unit labor requirements

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

Home and Foreign have a total labor force of 100 workers each.

- *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 country has a comparative advantage in cheese 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. Consumers' demand for cheese relative to wine depends on the relative price of the two goods:

  $$(Q_C + Q^*_C)/(Q_W + Q^*_W) = 4 - 5 \cdot P_C/P_W.$$

  Calculate the relative price P_C/P_W of cheese in world trade equilibrium. What if demand changes to $(Q_C + Q^*_C)/(Q_W + Q^*_W) = 6 - 5 \cdot P_C/P_W$? Comparing the consumption possibilities, show that both countries gain from trade.

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	$a_{LN} = 3$	$a^*_{LN} = 6$
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.]
- *Transport costs.* If transport costs add 50% to the price of a good that is shipped from one country to another, what goods will be traded?
- *Gains from trade.* Do both countries benefit from trade? Explain.

3 Sector-Specific Factors and Trade

Home can produce machinery and flowers (in bundels of 1,000). The marginal products of labor in the two industries and prices are

$$MPL_M = \tfrac{1}{2}\sqrt{K/L_M} \quad \text{and} \quad MPL_F = \tfrac{1}{2}\sqrt{T/L_F},$$

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 $T = K = 100$.

- *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
$$-MPL_F/MPL_M = -P_M/P_F.$$
- *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 800, to 1000 and 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.]