Economics 101 — Fall 2014

International Trade

Problem Set 1

October 6, 2014

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 (the amount of wine a country needs to sacrifice to obtain cheese). 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. What is the relative wage w/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 $L^{*\prime} = L' = 150$. How do the patterns of production and trade in the world change? Why? What is the relative wage w/w^* under free trade now?

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, what is the pattern of production and what is the pattern of trade? Will all goods be traded? [*Hint*: Calculate 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 production functions of the two industries 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. Consider goods prices $P_M = P_F = 1$. Factor supply is $L_M + L_F = 100$ and $T = K = 100$.

2

- 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 industries, 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 industries, 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 Classic Trade Theory and Policy (*Transfer Question*)

Home and Foreign produce machinery and food. The relative price of machinery P_M/P_F is 1 in the initial world-trade equilibrium.

- Suppose Home exports machinery and imports food. Draw the trade line (isovalue curve) and according indifference curves for Home. Depict a point of optimal consumption for Home.

- Now suppose Home imports machinery and exports food. Draw the according indifference curves for Home and depict a point of optimal consumption for Home.

- Return to the case of Home being a machinery exporter. The relative world-market price of machinery P_M/P_F rises to 2. How do production and consumption change? Is an increase in the terms of trade unambiguously beneficial (that is, do home consumers necessarily gain in utility)? How would your answer be different if Home were a machinery importer so that its terms of trade fell?

- Suppose Home is a *large open economy*, so that its policies affect relative world prices, and a machinery exporter. Machinery production is capital-intensive and Home's capital endowment increases. Use a relative-supply-relative-demand diagram to show how Home's terms of trade respond.

- Suppose Home is a *large open economy*, so that its policies affect relative world prices, and a machinery exporter. Home subsidizes its machinery sector, paying a subsidy on every unit exported (sold abroad). How do Home's domestic relative prices change? How are Home's terms of trade affected? Explain why domestic and world market relative prices change in opposite directions. How is Home's welfare affected?

- Suppose Home is a machinery exporter with a subsidy on machinery exports. Home now also imposes a tariff on its imports so that internal (domestic) relative prices are the same as they were under undistorted trade. How are Home's terms of trade affected? Does it matter whether Home is a small or large economy? What is the effect on Home welfare?