14.54 International Economics
Instructor: **Lorenzoni**

Problem Set 1 (Due 9/19)
Please, submit your problem sets in groups of 2 or 3 students.

1. Pure Exchange Economy

In this problem we will go through the model seen in class using an example with specific assumptions about tastes and endowments. Home and Foreign are endowed with different amounts of two goods, Apples and Bananas. The two countries are characterized by the following preferences. Home country's aggregate utility function is:

$$U = x_A^{\frac{1}{2}} x_B^{\frac{1}{2}}$$

while Foreign country's aggregate utility function is:

$$U^* = x_A^{*\frac{1}{3}} x_B^{*\frac{2}{3}}$$

The two countries' endowments are the following: Home has 100 Apples and 70 Bananas while Foreign has 50 Apples and 80 Bananas.

Let's start by looking at what happens if the two countries are in autarky and then we will analyze what happens if the two countries are allowed to trade.

As for all general equilibrium problems you have to think in terms of relative prices, therefore from now on we are interested only in the relative price of Apples relative to Bananas $p = \frac{p_A}{p_B}$, which is equivalent to assuming that we are taking Bananas as our numeraire, $p_B = 1$.

1. For the Home country draw a graph with the quantity of the two goods on the two axes and explain why at the consumption point the MRS must be equal to the autarky relative price. What is the meaning of autarky relative price since there is no exchange allowed with other countries? The autarky prices are in fact determined by two factors: what are these factors? Find the autarky price p in the Home country.

2. For the Foreign country do the same analysis and draw a graph showing what determines relative prices in autarky. Find the autarky price p^* in the Foreign country.

3. Now compare autarky prices in the two countries. In which country is the price of Apples higher relative to the price of Bananas? What factors determine the different autarky prices? In particular in this example why is $p \gtrless p^*$?

4. Now imagine the two countries are allowed to trade. Similarly to what we saw in class, draw an Edgeworth box, where the indifference curves for the two countries are drawn in the same graph. Show where the endowment point is located. Show also the "lens" area that cointains points which are preferred to the original endowment by both countries.

5. Derive the demand for both goods for both countries and find the equilibrium relative price at which the two countries exchange Apples for Bananas, p_T. What are *MRS* and *MRS** equal to in equilibrium?

6. Show the pattern of trade between the two countries. Which country exports Apples? Which country exports Bananas? Can you explain the pattern of trade by looking at the initial endowments and tastes?

7. Imagine the two countries are populated by Apple-owners and Banana-owners. Show that if no redistribution is allowed a group of owner in each country is damaged by free trade.

2. Biased Growth and Trade

There are two countries, Home and Foreign. There are two goods: Grains and Textiles. The preferences of the Home and Foreign consumers are described by the utility function:

$$\log x_G + \log x_T.$$

Each consumer in the Home country has a fixed endowment of 2 units of G and 1 unit of T. The consumers in the Foreign country have 1 unit of G and 2 units of T. That is, the endowments are:

$$e_G = 2, e_T = 1$$
$$e_G^* = 1, e_T^* = 2$$

1. Show, by deriving from utility maximization, that the demand functions for the two goods by the Home consumer are given by:

$$x_G = \frac{1}{2}\frac{1}{p_G}(p_G e_G + p_T e_T)$$
$$x_T = \frac{1}{2}\frac{1}{p_T}(p_G e_G + p_T e_T)$$

2. Find the relative prices in autarky in the two countries, $\left(\frac{p_G}{p_T}\right)^a$, $\left(\frac{p_G}{p_T}\right)^{*a}$. Show that
$$\left(\frac{p_G}{p_T}\right)^a < \left(\frac{p_G}{p_T}\right)^{*a}.$$

3. Now suppose there is free trade. Find the equilibrium relative price in the world market. What good is country Home exporting (importing)? Why? What are total exports of country Home?

4. Suppose there is growth in the textile sector in the Home country and the endowment of textiles becomes
$$e_T = 4.$$
All other endowments remain the same and there is still free trade. Find the new equilibrium price $\left(\frac{p_G}{p_T}\right)^T$ in the world market with the new levels of endowment.

5. What does this mean for the terms of trade of country Home? What are the total exports of country Home after growth has taken place? Was growth import-biased or export-biased? Who benefits from growth?

6. Can you show that country Foreign is worse-off after growth (hint: show that after growth takes place country Foreign goes back to autarky consumption). Use a graphical illustration to make your point.

3. **True/False and Comment**

Comment the following statements using the models and the concept we have seen in class so far. DO NOT WRITE MORE THAN 2 LINES.

1. Since in the US wages are higher than in China, China should produce all goods that require labor as an input.

2. Two countries produce a variety of products, among which Cars and Boats. Country A can produce Cars with 10 units of labor and Boats with 20 units of labor. Country B can produce Cars with 100 units of labor and Boats with 200 units of labor. Therefore there are no gains from trade between these two countries. (Hint: do you have enough information?)

3. In a two-country ricardian economy complete specialization depends only on the relative size of the two countries.