Economics 425 **Winter 2004**
International Trade Theory and Policy **Hiroyuki Kasahara**

Homework 2

(Due: February 9 before the class begins)

1. Consider a model with two countries, H and F, two goods, X and Y, and one factor of production, labour (L). Labour is mobile between industry X and Y within a country but is not mobile across countries. Labour in each country is fully employed.

   The technologies for producing the goods in country H are given by

   $$X^H = a_x^H L_x^H \qquad \text{and} \qquad Y^H = a_y^H L_y^H.$$

   The technologies for producing the goods in country F are given by

   $$X^F = a_x^F L_x^F \qquad \text{and} \qquad Y^F = a_y^F L_y^F.$$

   The price of X is normalized to 1. Denote the prices of Y (relative to X) in country H and country F by p^H and p^F, respectively. Consumers in both countries have the identical utility function given by

   $$U(X,Y) = X^{\beta} Y^{1-\beta}.$$

   In each country, there is a single consumer with the labour supply $\bar{L}$. The representative consumer maximizes her utility given her budget constraint,

   $$X + pY \leq w\bar{L},$$

   where w is the wage rate (relative to the price of X).

   The values of productivity parameters $(a_x^H, a_y^H, a_x^F, a_y^F)$ satisfy the following relationship:

   $$\begin{array}{rcl} a_x^H & > & a_x^F > 0 \\ a_y^H & > & a_y^F > 0 \\ \dfrac{a_x^H}{a_y^H} & > & \dfrac{a_x^F}{a_y^F} \end{array}$$

   (a) (10 points) Determine each country's autarkic equilibrium goods price ratio in terms of the model's parameters and then determine the pattern of comparative advantage between these two countries.

   (b) (10 points) Determine the free trade equilibrium price ratio in an equilibrium in which each country specialized in its good of comparative advantage.

(c) (10 points) Show that there are aggregate gains from trade for each country by comparing each consumer's utility level in free trade with her utility level in autarky.

(d) Suppose that the consumer in country F supplies $2\bar{L}$ units of labour rather than $\bar{L}$.

i. (5 points) Determine the new free trade equilibrium price ratio and explain how/why an increase in the size (labour supply) of country F changes the equilibrium price ratio intuitively.

ii. (5 points) Explain how an increase in the size of country F affects the utility level in country H.

(e) Suppose that the government in country H places an ad valorem tax of t on each unit of Y imported into the country so that the representative consumer's budget constraint is now given by

$$X^H + (1+t)p^H Y^H \leq w^H \bar{L}.$$

i. (5 points) Determine the equilibrium domestic price in country H, p^H.

ii. (5 points) Explain how an increase in this import tariffs t imposed by the government of country H affects the utility levels of country H and country F.

2. Consider an economy with two factors, two goods, and two countries (H and F). Both countries use capital and labour to produce two types of goods: agriculture and automobiles. Two countries are different in their endowments of labour and capital. Country H has $\bar{L}^H$ units of labour and $\bar{K}^H$ units of capital to supply to production. Country F has $\bar{L}^F$ units of labour and $\bar{K}^F$ units of capital. We assume that

$$\begin{aligned} \bar{K}^F &> \bar{K}^H > 0, \\ \bar{L}^F &> \bar{L}^H > 0, \\ \frac{\bar{K}^H}{\bar{L}^H} &> \frac{\bar{K}^F}{\bar{L}^F}. \end{aligned}$$

Countries are identical in their technologies:

$$X = \min\left\{\frac{K_x}{a_x}, L_x\right\}, \quad Y = \min\left\{\frac{K_y}{a_y}, L_y\right\}.$$

We assume that $a_x > a_y$. The price of agriculture products is normalized to 1. Denote the prices of automobiles (relative to agriculture products) in country H and country F by p^H and p^F, respecitvely. Consumers in both countries have the identical utility function given by

$$U(X,Y) = X^\beta Y^{1-\beta}.$$

Representative consumer maximizes her utility given her budget constraint,

$$\begin{aligned} X^H + p^H Y^H &\leq w^H \bar{L}^H + r^H \bar{K}^H, \\ X^F + p^F Y^F &\leq w^F \bar{L}^F + r^F \bar{K}^F, \end{aligned}$$

where w^i and r^i are the wage rate and the rental price of capital (relative to the price of agriculture products) of country i for $i = H, F$.

(a) (10 points) Determine each country's autarkic equilibrium goods price ratio in terms of the model's parameters and then determine the pattern of comparative advantage between these two countries.

(b) (10 points) Determine the free trade equilibrium price ratio in an equilibrium in which each country specialized in its good of comparative advantage.

(c) (10 points) Show that there are aggregate gains from trade for each country by comparing each consumer's utility level in free trade with her utility level in autarky.

(d) Suppose that the consumer in country F supplies $2\bar{L}^F$ units of labour rather than $\bar{L}^F$. Factor endowments of capital in both countries and factor endowment of labor in country H remain the same.

   i. (5 points) Determine the new free trade equilibrium price ratio and explain how/why an increase in the size (labour supply) of country F changes the equilibrium price ratio intuitively.

   ii. (5 points) Explain how an increase in the size of country F affects the utility level in country H.

(e) Suppose that the government in country H places an ad valorem tax of t on each unit of Y imported into the country so that the representative consumer's budget constraint is now given by

$$X^H + (1+t)p^H Y^H \leq w^H \bar{L}^H + r^H \bar{K}^H.$$

   i. (5 points) Determine the equilibrium domestic price in country H, p^H.

   ii. (5 points) Explain how an increase in this import tariffs t imposed by the government of country H affects the utility levels of country H and country F.