

Homework 3

(Due: March 18 before the class begins)

1 Small Open Economy and Export Subsidy

Consider a small open country H. There are two goods, X and Y, and one factor of production, labour L . Country H faces exogenous world prices of X and Y, p_x^* and p_y^* , respectively. The technologies for producing the goods in country H are given by $X = a_x L_x$ and $Y = a_y L_y$. Consumers have the utility function given by $U(X, Y) = X^\beta Y^{1-\beta}$. The labour supply is \bar{L} . Denote the domestic consumer's prices by q_x and q_y and the domestic producer's prices by p_x and p_y . The consumer supplies her labour and earns income from doing so. The representative consumer maximizes her utility given her budget constraint, $q_x X + q_y Y \leq I$, where I is income.

The values of productivity parameters (a_x, a_y) and the world prices $\frac{p_y^*}{p_x^*}$ satisfy the following relationship:

$$\frac{a_x}{a_y} > \frac{p_y^*}{p_x^*}$$

1. (10 points) Determine the pattern of comparative advantage for country H and show that there are aggregate gains from trade by comparing each consumer's utility level in free trade with her utility level in autarky. (Draw a figure with production possibility frontier and indifference curves).
2. (10 points) Suppose that a government of country H decides to promote industry Y (say, industry Y is high-tech industry) by *production subsidy*. Specifically, suppose that it imposes an ad valorem subsidy rate s on productions of Y so that $p_y = (1 + s)p_y^*$.¹ Assume further

¹The consumer's price is not going to be affected by production subsidy so that: $q_y = p_y^*$.

that s is large enough, leading to the condition $\frac{(1+s)p_y^*}{p_x^*} > \frac{a_x}{a_y}$. The production subsidy is financed by the lump sum tax and, therefore, the consumer's budget constraint is given by: $q_x X + q_y Y \leq I$, where $I = p_x^* X + p_y Y - [p_y^* s Y]$. Using a figure with production possibility frontier, indifference curves, and export-import triangles, show the effect of this production subsidies on (a) trade patterns and (b) country H's welfare.

3. (10 points) Suppose that a government of country H decides to promote industry Y by *export subsidy*. Specifically, suppose that it imposes an ad valorem subsidy rate s on exports of Y so that $p_y = q_y = (1 + s)p_y^*$, where the condition $\frac{(1+s)p_y^*}{p_x^*} > \frac{a_x}{a_y}$ holds. The export subsidy is financed by the lump sum tax and, therefore, the consumer's budget constraint is given by: $q_x X + q_y Y \leq I$, where $I = p_x^* X + p_y Y - [p_y^* s E]$; here, E is the excess supply (or export) for good Y. Using a figure, show the effect of this export subsidies on (a) trade patterns and (b) country H's welfare.
4. (5 points) Is export subsidy better/worse than production subsidy from the welfare viewpoints? Explain.
5. (5 points) Is it *possible* for country H to be worse off with export subsidy than in the autarky equilibrium.

2 Free Trade Agreement

Consider the model of Homework2, Question 2: two countries, H and F, two goods, X and Y, and one factor of production, labour (L). The technologies for producing the goods in country H are given by $X^H = a_x^H L_x^H$ and $Y^H = a_y^H L_y^H$. The technologies for producing the goods in country F are given by $X^F = a_x^F L_x^F$ and $Y^F = a_y^F L_y^F$.

Consumers in both countries have the identical utility function given by $U(X, Y) = X^{0.5} Y^{0.5}$. The world prices of X and Y are denoted by p_x^* and p_y^* . Denote the domestic consumer's prices by q_x^i and q_y^i and the domestic producer's prices by p_x^i and p_y^i for $i = H, F$.

Country H imposes an import tariff on Y at rate τ . Country F imposes an import tariff on X

at rate τ . The values of parameters $(a_x^H, a_y^H, a_x^F, a_y^F, \tau)$ satisfy the following relationship:

$$\frac{a_x^H}{a_y^H} > \frac{a_x^H}{(1+\tau)a_y^H} > \frac{(1+\tau)a_x^F}{a_y^F} > \frac{a_x^F}{a_y^F}.$$

Assume that the values of parameters are such that both countries specialize in its good of comparative advantage. This implies that country H specializes in production of X and that country F specializes in production of Y.

Since country H imports Y and exports X, $q_y^H = p_y^H = (1+\tau)p_y^*$ and $q_x^H = p_x^H = p_x^*$. Since country F imports X and exports Y, $q_y^F = p_y^F = p_y^*$ and $q_x^F = p_x^F = (1+\tau)p_x^*$.

Denote the labor supplies of country H and country F by \bar{L}^H and \bar{L}^F , respectively. The consumer earns income from supplying its labor. The consumer also receives tariff revenue. The income of the consumer in country H is $(I^H = p_x^*X_S^H + \tau p_y^*Y_D^H)$, where X_S^H is the supply of X and Y_D^H is the import demand of Y in country H. The income of the consumer in country F is $(I^F = p_y^*Y_S^F + \tau p_x^*X_D^F)$, where Y_S^F is the supply of Y and X_D^F is the import demand of X in country F.²

1. (10 points) Determine the world relative prices of X to Y, $\frac{p_x^*}{p_y^*}$, in the tariff equilibrium.
2. (10 points) Draw graphs of the production possibility frontiers of both countries together with indifference curves and export-import triangles.
3. (10 points) Is it *possible* for both countries to be worse off with import tariffs than in the autarky equilibrium?
4. Suppose that country H makes a unilateral trade liberalization (i.e., no import tariffs for Country H). Country F keeps its import tariffs.
 - (a) (5 points) Determine the effect of this unilateral trade liberalization of country on the world relative prices of X to Y, $\frac{p_x^*}{p_y^*}$. Provide intuition for the direction of the change.
 - (b) (10 points) Determine whether this unilateral trade liberalization of country H will lead to a welfare gain for (i) country H and (ii) country F. (Use graphs.)

²Hint: The income level I^H can be solved from $I^H = p_x^*X_S^H + \tau p_y^*Y_D^H$ and the demand function $Y_D^H = 0.5 \frac{I^H}{q_y^H}$.

5. Suppose that country H and country F make a free trade agreement; the import tariffs for both countries are eliminated.
- (a) (5 points) Determine the effect of the free trade agreement on the world relative prices of X to Y, $\frac{p_x^*}{p_y^*}$.
- (b) (10 points) Determine the effect of the free trade agreement on (i) welfare and (ii) volume of trade. (Use graphs.)