

# International Trade – Fall 2019

## Problem Set 5

### Economic Geography

#### 1. New Economic Geography

Consider the following variant of the Krugman (1991) model. First, assume the following definition and normalizations:

- The world endowment of skilled workers is  $H = H_A + H_B = 1$ , where  $H_A$  is the amount of skilled workers residing in  $A$  and  $H_B$  is the number of skilled workers living in  $B$ . Skilled labor is specific to the manufacturing sector.
- The world endowment of unskilled labor is  $L = 1 - b$ , where  $b \equiv \frac{\mu}{\sigma}$  and  $\mu$  is also the fixed fraction of income consumers in both countries spend on the manufacturing good  $C_m$ . Each country has  $1/2$  of the world endowment of unskilled labor.
- The unit unskilled-labor requirement in agriculture is one and the agricultural good is freely traded between the two countries  $A$  and  $B$ . The unit labor requirement in manufacturing is normalized to  $a_m = \frac{\sigma-1}{\sigma}$ .
- Unlike in Krugman (1991), the total cost of production for a firm in the manufacturing sector located in country  $i = A, B$

$$C_i = w_i^H + w_i^L a_m x_i$$

where  $w_i^H$  is the wage of skilled workers in count  $i$  and  $w_i^L$  is the wage of unskilled worker in country  $i$ . Varieties made in country  $i = A, B$  and sold in country  $j \neq i$  face an iceberg trade cost  $\tau > 1$ .

- a. Find the equilibrium per-firm prices and number of firms/varieties in each country. Comment on differences and similarities with Krugman (1991).
- b. Derive the equilibrium incomes  $Y_A$  and  $Y_B$  and price indexes  $P_A$  and  $P_B$ . Use these to obtain the following expression for the equilibrium wage of skilled workers in region  $i$ :

$$\omega_i^H = \frac{b}{2} \frac{2\phi H_i + \varphi H_j}{\phi(H_i^2 + H_j^2) + \varphi H_i H_j}.$$

where  $\varphi \equiv [1 - b + (1 + b)\phi^2]$ . (Hint: you are not asked to show all the algebraic steps to get this solution, but you should be able to clearly define the equilibrium conditions that must hold to arrive at this solution.)

- c. For which values of  $\phi$  does the larger region (in terms of skilled workers) offer the highest nominal wage? Discuss the role that agglomeration and dispersion forces play in.
- d. Find an expression for the real wages,  $w_i$  for  $i = A, B$ . For a given nominal wage, how does an influx of skilled workers affect real wages? Does this lead to agglomeration or dispersion? Discuss.
- e. Consider now the long-run equilibrium. Workers move to the region that warrants them the highest real wage. Show that the symmetric outcome ( $\lambda = \frac{1}{2}$ ) where  $\lambda$  is the share of skilled workers living in A) in an equilibrium.