## ECONOMIC INTEGRATION IN THE AMERICAS ECON 4421

## **PROBLEM SET #3**

1. Consider a world economy that is similar to the one in question 1 on the first problem set. There are two countries and two produced goods. We call country 1 the United States and country 2 Latin America. The production technologies in the two countries are different:

$$y_1^{us} = \ell_1^{us} / 2, \quad y_2^{su} = \ell_2^{us} / 4$$
$$y_1^{la} = \ell_1^{la} / 20, \quad y_2^{la} = \ell_2^{la} / 10$$

The United States has population  $\overline{\ell}^{us} = 100$ , and Latin America has population  $\overline{\ell}^{la} = 500$ . The representative consumer in each country has the utility function

$$\log c_1^i + \log c_2^i$$

where i = us, la.

(a) What is the autarky equilibrium in each country? What is the free trade equilibrium for the world economy? Calculate the real income levels in each country in autarky and in free trade. Calculate the same real income levels in per capita terms.

(b) Suppose now that technological progress changes the production function in Latin America for good 2 to  $y_2^{la} = \ell_2^{la} / 5$ , while the production function for good 1 remains  $y_1^{la} = \ell_1^{la} / 20$ . The production functions in the United States stay the same. Calculate the free trade equilibrium for this world economy and compare it to the free trade equilibrium in part a. In particular, compare the real income levels per capita in each country before and after technological progress.

(c) Suppose now that, instead of technological progress in good 2, Latin America experiences technological progress in good 1. The production function for good 1 becomes  $y_1^{la} = \ell_1^{la}/5$ , while the production function for good 2 remains  $y_2^{la} = \ell_2^{la}/10$ . The production functions in the United States stay the same. Calculate the free trade equilibrium for this world economy and compare it to the free trade equilibrium in part a. In particular, compare the real income levels per capita in each country before and after technological progress.

(d) Explain how your results in parts b and c show, not that free trade is harmful to the United States, but that not all technological progress in Latin America is beneficial to the United States. [Hint: take a look at P. A. Samuelson, "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization," *Journal of Economic Perspectives*, 18 (2004), 135–146.] Can you identify implications of the model for data on trade flows and relative prices that could help us distinguish whether we are in the situation in part b or that in part c?

2. Consider an economy in which there are two types of goods, agriculture and manufactured goods. Agricultural goods are homogeneous are produced using labor according to the constant returns to scale production function

$$y_0 = \ell_0.$$

Manufactured goods are differentiated by firm. The production function for firm j is

$$y_j = (1/b) \max[\ell_j - f, 0].$$

Here f is the fixed cost, in terms of labor, necessary to operate the firm and b is the unit labor requirement. Suppose that there is a representative consumer with preferences

$$\log c_0 + (1/\rho) \log \sum_{j=1}^n c_j^\rho$$

where  $\rho > 0$ . There is an endowment of  $\overline{\ell}$  units of labor.

(a) Define a monopolistically competitive equilibrium for this economy in which firms follow Cournot pricing rules and there is free entry and exit.

(b) Suppose that b = 2, f = 6,  $\rho = 1/2$ , and  $\overline{\ell} = 100$ . Calculate the autarky equilibrium.

(c) Suppose now that  $\overline{\ell} = 1000$ . Calculate the equilibrium.

(d) Interpret the equilibrium in part c as a trading equilibrium among two countries, one with  $\overline{\ell}^1 = 100$  and the other with  $\overline{\ell}^2 = 900$ , but otherwise identical. Assume that manufacturing firms are distributed proportionally across countries. What impact does trade have on the number of manufacturing firms in each country? The average output of firms? The total number of products available? Consumer utility? Illustrate the efficiency gains using an average cost curve diagram.

(e) Explain how your answer to part d is related to the debate in Canada on the U.S.-Canada Free Trade Agreement.