

Problem Set 1

This problem set is due on February 22th in class.

Exercise 1

This exercise is designed to revisit our analysis of the effects of technological “catch-up” in Lecture 2. Consider a dynamic version of the two country (Home and Foreign) Ricardian model of trade in Dornbusch, Fisher and Samuelson (1977), but with the following additional structure:

- a. There is a “best-practice” unit labor requirement for good i at time t given by

$$a^{Best}(i, t) = \exp\{-g(i)t\}, \text{ for } i \in [0, 1].$$

$a^{Best}(i, t)$ thus falls at rate $g(i)$ (think of this as technological progress);

- b. Home lags λ^H years behind this frontier, so its unit labor requirements are

$$a^H(i, t) = \exp\{-g(i)(t - \lambda^H)\}, \text{ for } i \in [0, 1].$$

- c. Similarly, Foreign lags $\lambda^F > \lambda^H$ years behind the frontier:

$$a^F(i, t) = \exp\{-g(i)(t - \lambda^F)\}, \text{ for } i \in [0, 1].$$

- d. Preferences are Cobb-Douglas with an equal share of spending on all goods:

$$U^k = \int_0^1 \log c^k(i) di, \quad \text{for } k = H, F$$

1. Solve for the autarkic equilibrium at a particular time t in each country. Compute each country's welfare under autarky.

2. Solve implicitly for the relative wage w^N/w^S and the threshold good \hat{i} at any point in time t in the free trade equilibrium.
3. Study how the relative wage w^N/w^S depends on λ^H , λ^F and t ?
4. Study the welfare implications of a decrease in λ^F . What happens when $\lambda^F \rightarrow \lambda^H$? How do these results differ from the improvement in Foreign's technology analyzed in Lecture 2. Provide intuition.

Exercise 2

This exercise is designed as an introduction to the specifics-factor model, which we will not have time to cover in class. Consider a two-sector (A, B), three-factor (K_A, K_B, L), small open economy. Technology in sector $i = A, B$ is given by

$$X_i = f_i(K_i, L) \text{ for } i = A, B, \quad (1)$$

where $f_i(\cdot)$ features constant returns to scale, continuously diminishing marginal products and the standard Inada conditions. Labor is perfectly mobile across sectors, but capital of type i , K_i , can only be used in sector i . All markets are competitive and the economy faces exogenously given goods prices p_A and p_B .

1. Describe the set of equations characterizing the equilibrium of this small open economy (you can define the cost functions dual to (1)).
2. Under which conditions would two small open economies of this sort share identical factor prices?
3. Study the effects of an increase in the price of good A on the nominal and real rewards of the three factors. Relate this to the Stolper-Samuelson theorem.
4. Suppose capitalists are considering forming a lobby to push for import protection? Would they be more or less likely to reach an agreement than in the 2×2 Heckscher-Ohlin model?
5. Study the effects of an increase in the endowment of factor K_A on the output of sectors A and B . Relate this to the Rybczinski theorem.
6. Study the effects of an increase in the endowment of labor L on the output of sectors A and B . Relate this to the Rybczinski theorem.