

## Problem Set 1

(I) Country A and Country B both have the production function:

$$Y = F(K, L) = K^{1/2} L^{1/2}.$$

(a) Show that the production function has constant returns to scale?

(b) What is the per-worker production function,  $y = f(k)$ ? (where  $y = Y/L$ ,  $k = K/L$ )

(c) Assume that neither country has population growth or technological progress and that 5% of capital depreciates each year. Assume further that country A saves 10 % of output each year and country B saves 20 % of output each year. Use your answer from part (b) above and the Balanced Growth Path (BGP) condition that  $\Delta k = 0$  to find the level of capital per worker for each country at the BGP. Then find the levels of income per worker and consumption per worker at the BGP.

(d) Suppose that both countries start off with a capital stock per worker of 2. What are the levels of income per worker and consumption per worker at the initial period?

Remembering that the change in the capital stock is investment less depreciation, use a calculator (or Excel) to show how the capital stock per worker and the output per worker will evolve over time in both countries. For each year, calculate also consumption per worker.

How many years will it be before the consumption in country B is higher than the consumption in country A?

If you do it with a calculator, five periods are enough, with Excel you can do 20 or so.

(II) Exercises 1, 2 and 3 from Jones, pages 51 and 52.

In exercise 1, assume that the rate of growth of output per worker in the period when the savings rate decreases is positive.