

1. Assume that

$$T_{t+1} = BN_t T_t + T_t \quad (1)$$

where B is the parameter, T_t is the level of knowledge at date t and N_t^T is population in knowledge accumulation sector at date t .

- (a) Given this assumption, the growth rate of knowledge accumulation is proportional to population. What is an economic rationale for this assumption?
- (b) Jones (1995) criticizes equation (1). Summarize the essence of his arguments.
- (c) Jones (1995) provides an alternative functional form:

$$T_{t+1} = BN_t^T T_t^\beta + T_t, \quad 0 < \beta < 1.$$

Assume that economy is on the steady state: that is $g_T = g$. Show that g is proportional to population growth in the knowledge accumulation sector, n .

2. Consider the following production function

$$Y = K^\alpha (TN)^{(1-\alpha)},$$

where Y is GDP, K is capital stock, N is the number of population and T is an unknown productivity measure. Suppose that productivity is the same across countries and $\alpha = \frac{1}{3}$.

- (a) Suppose that $T = Ah$, where h is human capital and A is unknown productivity. Express GDP per capita as a function of capital output ratio, human capital and unknown productivity.
 - (b) Economists find that the large proportion of income differences can be explained by unknown productivity differences. What would be the possible source of A ?
3. Any activities can be decomposed into productive activity and unproductive activity.
- (a) What is the main difference in two activities?
 - (b) Give us 5 examples of unproductive activities.
 - (c) What policies can government pursue to encourage productive activities?