

Sample Midterm Exam¹

I. Choose the **3 out of 4** of the following pairs of concepts. For each pair, explain the concepts briefly and discuss the connection between the two concepts.

- a. factor accumulation vs. productivity gains
- b. capital widening vs. capital deepening
- c. Neoclassical growth model vs. endogenous growth model
- d. Lorenz curve vs. Kuznets curve

II. (True, False, or Uncertain – Make sure to justify your answers by explaining your logics, giving examples, or using graphical illustrations.

- 1. Population growth is always harmful to economic development.
- 2. Economic growth will improve health outcomes of the population.

III. Growth Accounting

Suppose that the *annual percentage rates of change* in total output, total employment, and the contributions to output per worker of physical and human capital in a hypothetical country during two time periods are given in the following table.

[Note: All the numbers in the tables are in percentage terms.]

Time Periods	Total Output	Employment	Contribution to Output Per Worker of	
			Physical Capital	Human Capital
1960-1969	8.4	2.0	3.2	2.2
1970-1979	9.7	2.2	3.6	2.4

- a. (10 points) For each time period, calculate the followings:
 - (i) the growth rate of output per worker,

¹ These are sample exam questions only. On the real exam, there might be more or fewer questions.

- (ii) the growth rate of total factor productivity (TFP)
 - (iii) the growth rate of physical capital and the growth rate of human capital, given that the share of physical capital is 0.4 in both periods, and
 - (iv) the contribution of factor accumulation to the output growth (i.e. what percentage of output growth?).
- b. (5 points) According to the results above, discuss the changes in the output growth during the two periods. How do the sources of growth change over time?

III. Growth Models

Consider a country in which the national output is described by the aggregate production function:

$$Y = F(K, L) = 50K^{2/3}L^{1/3}$$

where Y is the total income, K is the total capital, and L is the total number of workers in the economy.

Suppose that capital accumulation is characterized by:

$$\Delta K = sY - dK$$

where s is the saving rate, d is the depreciation rate of capital.

- a. Suppose that the saving rate is 0.3, population growth (n) is 0.01, and the depreciate rate (d) is 0.02. Determine the steady-state level of *capital per worker* (k), where $k = K/L$. What are the growth rate of per capita income ($\Delta y/y$) and the growth rate of total income ($\Delta Y/Y$) in the economy in the long run?
- b. Discuss the augmented Solow model in Mankiw, Romer, and Weil's (1992) paper. What is the main difference between the "Textbook" Solow model and the "Mankiw-Romer-Weil" Solow model? Based on the empirical evidence in this paper, is there convergence in per capita income across countries? Discuss briefly.