6. The Solow model

**6.1** Suppose an economy which functions in accordance with the hypotheses of the Solow model and which is currently *below* its steady-state in terms of capital per worker and output per worker.

a) Draw the Solow diagram and represent the current situation of this economy.

b) According to the model, what will tend to happen to this economy in the short-run and the long-run? Explain the economic mechanisms that will bring about these outcomes.

**6.2** Suppose an economy which functions in accordance with the hypotheses of the Solow model and which is currently in its steady state.

a) Draw the Solow diagram and represent the current situation of this economy.

b) Suppose the following changes occur in this economy (each one in its turn, i.e. not all at once, and ceteris paribus). Represent the corresponding graphical shifts and describe the consequences to the economy in the short-run and the long-run:

i. a decrease in the savings rate;

ii. a positive change in the available technologies;

iii. an increase in the depreciation rate;

iv. a decrease in the population growth rate;

v. a sudden reduction in the available stock of physical capital per worker, e.g. due to a natural disaster;

vi. a one-off increase in the population, e.g. due to a sudden inflow of refugees.

**6.3** Suppose an economy which functions in accordance with the hypotheses of the Solow model and is adequately described by the following Cobb-Douglas production function:

*Y* = 0,2.*K*α.*L*1−α

Further assume that the population is growing at an annual rate of 0.5%, the depreciation rate of physical capital is 4%, the investment rate is 25% and the partial elasticity of GDP with respect to physical capital is 0.6. For simplification, assume also that the total population, labour force and employed population are identical.

a) Formalize the model which represents the functioning of this economy and find the steady state level of physical capital per worker. Represent this graphically.

b) Find the steady state levels of GDP per worker, consumption per worker and investment per worker. Represent these values graphically.

c) With everything else constant, what will be the effect upon the steady state of an increase in the population growth rate to 1%? Represent this change graphically.

d) With everything else constant, what will be the effect upon the steady state of an increase in the investment rate to 30%? Represent this change graphically.

**6.4**. Consider an economy which functions in accordance with the Solow model and which is adequately described by the production function Y = 0,4.Kα.L1−α. Assume that the partial elasticity of GDP with respect to physical capital is 0.4, the population growth rate is 1% and capital depreciates at 5% per annum.

a) Find what the investment rate must be if the steady state level of physical capital per worker is *k\** = 2.5?

b) If *k* is indeed at *k\** = 2.5, what is the growth rate of GDP?