NOTES

Programme: TYBA

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Unit IV: Theories of Economic Growth and Development

Module Name: Neo- Classical Growth Theory: Solow-Swan

Module No: 17

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Neoclassical growth theory

There are three basic propositions of neoclassical growth theory:

1) In the long-run steady state, the growth of output is determined by the labour force in efficiency units, that is, by the rate of growth of the labour the rate of growth of labour productivity (exogenously given as in Harrod, of growth), and is independent of the ratio of saving and investment to COD because a higher savings or investment ratio is offset by a higher capital-out lower productivity of capital, because of the neoclassical assumption of diminishing returns to capital.

2) The level of per capita income (PCY), however, does depend on the ratio of savings and investment to GDP. The level of PCY varies positively with the savings-investment ratio and negatively with the rate of growth of the population.

3) If there is an inverse relation across countries between the capital-labour ratio and the productivity of capital, and tastes (i.e. savings behaviour) and technology are the same across countries poor countries with a small amount of capital per head should grow faster than rich countries with a lot of capital per head, leading to the convergence of per capita incomes and living standards across the world.

Let us now consider how these fundamental propositions are arrived at. The basic neoclassical growth model was first developed by Robert Solow and Trevor Swan in 1956, and has been very influential in the analysis of growth ever since - particularly the use of the aggregate production function, as we shall see. The model is based on three key assumptions (ignoring for the moment technical progress).

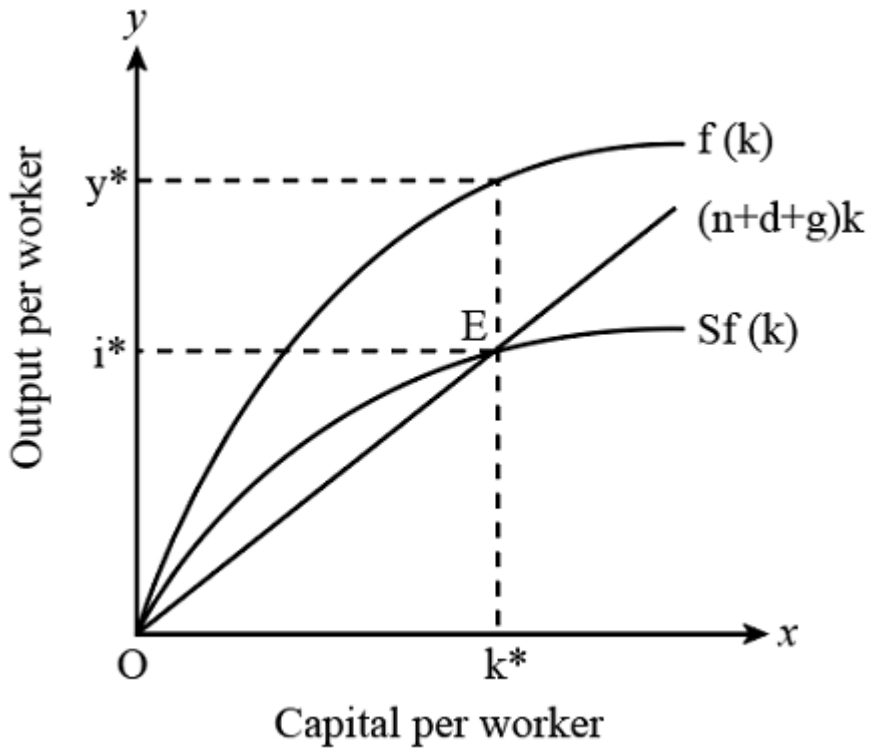
• The labour force grows at a constant exogenous rate, I

• Output is a function of capital and labour: Y=F(KL); the production function relating output to inputs exhibits constant returns to scale, diminishing returns to individual factors of production, and has a unitary elasticity of substitution between factors (see later)

• All saving is invested: S=I=sY; there is no independent investment function.

What the basic neoclassical growth model is designed to show that an economy towards a long-run equilibrium capital-labour ratio at which output (or income is also in equilibrium, so that output, capital and labour all grow at the same rate. Therefore, predicting long-run growth equilibrium at the natural rate.

Physical capital faces the problem of diminishing Returns apart from that it also it's over time due to its wear and tear. For example, bridges and roads made many years back requires extra maintenance expenditures as they are duty deteriorate overtime due to natural wear and tear.

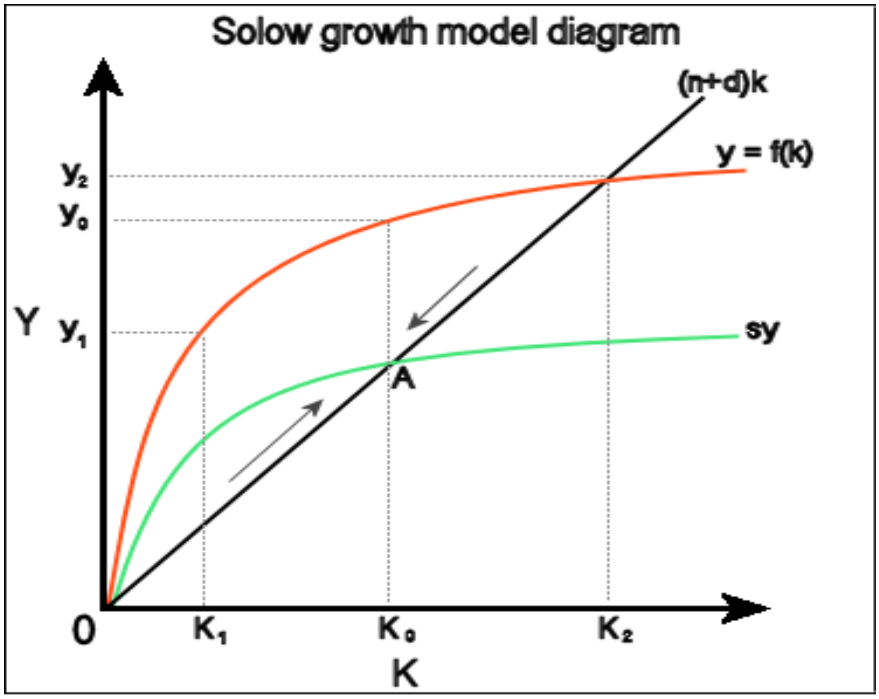


(Figure no 9.1 is from https://study.com/academy/answer/solow-model-graphing-a-graph-the-solow-model)

In this diagram we see the amount of depreciation is shown as a 45-degree line from the point of origin, depreciation increases at a constant rate. The more capital you have the more depreciation you have. Now let's add savings to this diagram which is the same as the amount of invested due to the assumption all savings are invested. If we assume investment as a constant proportion of economic output that we get an Investment curve which will

mimic the production function (economic output) but will be lower than production function as it is it's constant proportion.

The fist units of capital are very productive as it creates more output, but the output goes on diminishing as more capital is added indicating diminishing returns to capital shown by the shape of production function. The same is true for investment in relation to increase of capital stock.



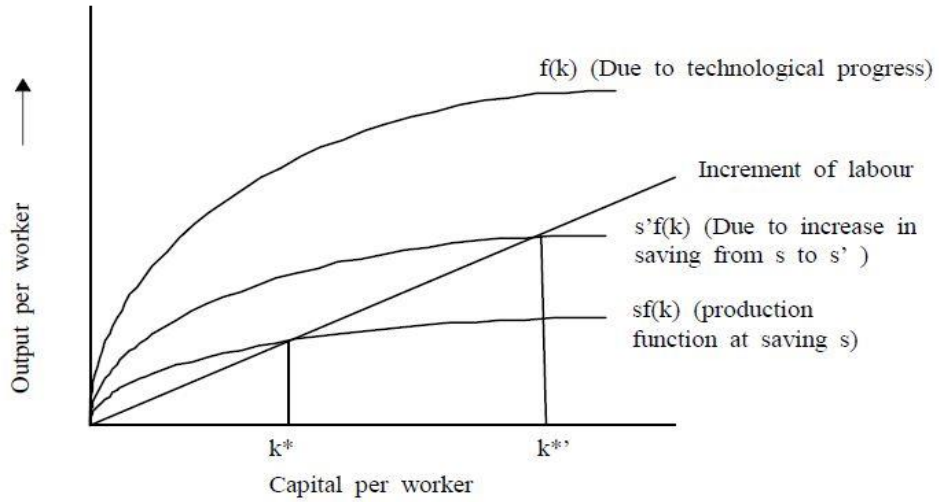
(Figure no 9.2 is from https://www.quora.com/Why-do-poor-countries-grow-faster-than-rich-countries-in-Solow-model

Depreciation is growing at the same rate as the capital stock grows each new unit of capital creates an equal amount of depreciation. Now notice that when investment is greater than depreciation that means the capital stock must be growing as we adding more units of capital then the amount of depreciation. But as the capital stock grows investment and depreciation will intersect each other. At this point there is no new capital being generated as the amount of investment is used to make up for the depreciation. "This is called the steady-state level of capital as advocated in the solow model, at this point we also reach the steady-state level of Output". On the other side of the steady-state point define that depreciation is greater than investment that means some of the capital stock needs repair but this but there isn't enough investment to do or of the needed repairs so the "capital stock shrinks" pushing it back to the steady state

To the left of steady-state: Investment > Depreciation (Capital stock is Growing)
At steady-state: Investment = Depreciation (Capital stock is Constant)
To the right of steady-state: Investment < Depreciation (Capital stock is Shrinking)

Any point to the left or right of the steady state will be pushed by these forces back to the point of steady-state.

We see the historical evidence of steady-state with the example of Germany post World war-II as it grew faster initially with increase of capital stock. But over time this capital stock grows to an extent, requiring huge expenses in its maintenance and repairs that it cannot generate any additional capital stock, making economic growth come down.



(Figure no 9.3 is from https://article1000.com/solows-model/)

Even if we increase the amount of savings, there will only be a temporary increase in growth as we can see in the diagram giving rise to another point of steady-state of capital and output again bringing the economic growth to a halt.