**Department of Economics-Vidyasagar University**

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**Barro Growth Model**

Like the learning by doing approach or knowledge spill over model, Barro (1990) developed the increasing returns to scale in the overall production system by introducing the public sector that is capable of endogenizing the technological progress and thereby explaining the increasing growth of capital and output per capita in the long run. In the Barro model public spending goes for public investment (infrastructures, schools, sanitation, institutional facilities, good governance, etc.). Public investments, which are financed through income taxes, complement private investments so that there are crowding-in effects of this public investment and thereby promoting growth of output. Since public investments raise the productivity of private investments, higher taxes can be associated with an increase or a decrease in overall growth. If government expenditure is kept fixed and there are constant returns to scale in L and K, then the working of diminishing returns to the factors cannot be barred. If we allow government expenditure as variable in accumulation of capital, then the working of diminishing returns will no longer be there and the economy is capable of producing endogenous growth like the simple AK type model.

The model of Barro adds public spending to the AK model. Suppose the production function is like the following-

Y = AL1-α. Kα. G1-α

where G stands for the public expenditure on goods and services. The production function exhibits increasing returns to scale (IRS). Suppose increase all the factors by λ proportion then new output is

A.(λL)1-α. (λK)α. (λG)1-α = λ2-α. AL1-α. Kα. G1-α =λ2-α. Y

Since 0<α<1, 2-α >1 and hence new output after introduction of government sector is greater than the scale effect. Hence, IRS is working and there is possibility of making increasing growth rates of income over time.

Suppose the production function in the Barro model is

Y = BK1-αGα

where BK1-α is technological progress, A, determined by the accumulation of capital. Public expenditure, G, depends on the amount of revenue generated through income tax, υ.Y, where ‘υ’ represents rate of income tax with 0 <υ< 1. Hence, public expenditure function is

G = υ.Y

To determine the long run growth rate of capital and income, we first determine the value of B. To get this let us substitute the government expenditure function into the production function which gives the following:

Y = BK1-α (υ.Y) α

Or, Y 1-α = B υ α. K1-α

Or, Y = B 1/1-α .υ α/1-α. K

Or, Y = D.K

where D = B 1/1-α .υ α/1-α

The marginal productivity of capital with given government expenditure and population is dY/dK = D = constant, not diminishing. Hence, there is the possibility of scale effect and getting output growth to be positive.

Now recall the rule of capital which is as follows-

dK = I – δK

or, dK = s .(1-υ).Y – δK

After substitution of the expression of Y from above we get

dK = s. (1-υ). D.K - δK

or, dK = s. (1-υ). B 1/1-α .υ α/1-α. K – δK

or, dK/K = s. (1-υ). B 1/1-α .υ α/1-α – δ

or, dK/K = s. (1-υ). D – δ

Now the rate of growth will be positive as long as s. (1-υ). D > δ. Therefore, introduction of public expenditure in developmental projects makes the positive growth of income and consumption in place of zero growth results under the neoclassical growth model. Hence, public sector makes the technological progress to be endogenous.