CHAPTER - II
GROWTH PROCESS AND INVESTMENT BEHAVIOUR

The theoretical framework developed in chapter I maintains that investment is a necessary condition for economic growth. Furthermore, it is also maintained that investment is efficient when it is associated with increasing returns and therefore it is consistent with an investment policy implied by a structural pattern that conforms to accelerated growth in a developing economy.

In this chapter a literature survey of existing growth theories is taken up to bring out the factors that affect economic growth and thereafter examines the role of investment in this process. It examines whether the role of investment in this growth process amounts to efficient investment as postulated in chapter I.

In this study mainly three approaches to economic growth are taken up. One is the Harrod - Domar model which views that rate of investment is an important factor in bringing about economic growth. The second growth theory taken up is the Neo-classical model of the Solow type which suggests investment pessimism, i.e., rate of growth of output is independent of the rate of investment. The subsequent literature on these models is also studied in order to examine the significance of investment in economic
The third approach taken up is that in which investment efficiency is emphasised as a necessary condition for economic growth to occur. On the basis of discussion on these growth theories this study brings out the relevant features of the growth framework where an increase in growth rate implies efficiency of investment.

SECTION 2.1: HARROD - DOMAR MODEL

The central idea in this model is that growth of output proceeds pari passu with capital accumulation. This significance of investment, which says that investment leads to growth, is specified in the model in terms of a desirable rate of growth which is primarily determined by rate of investment. The meaning of 'desirable' rate of growth is elucidated here to bring out the importance of investment in economic growth.

In this model, the desirable rate of growth is taken to mean a warranted rate of growth along which there is a continuous balance between the demand for and supply of output. This warranted rate of growth, given a technologically determined capital-output ratio, is dependent on a particular rate of investment, which equals rate of savings along the warranted growth path. The latter, accordingly, is taken to be the policy variable in the model. In subsequent literature on this model, Mathur
(1973) points out that for a particular rate of investment and for a given capital-output ratio, different assumptions about consumption behaviour and determination of savings, would yield different rates of growth that are warranted. Hence, the concept of a desirable rate of growth involves a further choice of a particular warranted rate of growth. This choice in the Harrod-Domar model, amounts to a warranted rate of growth that equals the rate of growth of labour and the rate of technological progress. In this case, the warranted rate of growth is the natural rate of growth, when the labour requirement at the current level of productivity is equal to the potential labour force.

It should be emphasised that the desirable rate of growth in the Harrod-Domar model involves a growth path that exhibits a constant rate of growth of output. This is in line with the technological progress assumed in the model that yields a constant capital-output ratio. Moreover, the capital-output ratio, corresponding to the desired growth path, reflects the capital requirement to yield the maximum output, i.e., potential capacity to maintain full employment in some sense, given the technological knowledge in the economy. Given this capital-output ratio, investment and output grow at a constant rate to maintain full employment along which capacity output is matched by a demand for it.
In this perspective, the significance of investment in the Harrod-Domar model is reflected by a rate of investment that corresponds to natural growth rate. On the other hand, a growth path that exhibits increasing rate of growth or a decreasing rate of growth is considered a departure from the constant rate of growth, and investment may lead to inflation or unemployment, rather than leading to economic growth.

In subsequent Harrod-Domar literature, the rate of investment may be viewed as being important for making the economy move from a lower rate of growth to a higher rate of growth. However, this is with reference to contexts where a low rate of growth is viewed as a departure from the desirable growth path maintained in the model. In studies by Kaldor (1955-56), Pasinetti (1961-62) the lower rate of growth reflects unemployment, given a capital-output ratio that corresponds to the natural growth rate. The economy can move towards the natural growth rate through a redistribution of income which yields the required rate of investment. One can also view a low rate of growth as a departure from the warranted rate of growth in line with the study by Mathur (1973). Here, the low rate of growth reflects excess supply in terms of accumulation of inventories. In this case, given the capital-output ratio corresponding to the warranted growth path and a particular
entrepreneurial expectation regarding future demand, the rate of investment plays an important role in moving the economy back to the warranted growth path.\(^9\)

The Harrod-Domar model, in this perspective, discusses the role of investment only in the context of equilibrium growth and its stability.\(^{10}\) The role of investment in bringing about economic growth is not discussed when economic growth means a higher rate of growth for reaching a higher warranted growth, when there is a departure from the warranted growth path. In this sense, this model does not shed light on the significance of investment when the economy is in a state of low growth that reflects a low capacity output due to a low capital stock.

Moreover, as Mathur (1973) points out, a disequilibrium situation as reflected by a departure from warranted growth path is a state where there is excess supply (or demand) in different sector of the economy. In this case, the role of investment for subsequent expansion of production is mainly in terms of adjustment to the different rate of return in different sectors of the economy.\(^{11}\) In other words, a reallocation of investment, rather than a change in the rate of investment, as suggested by the Harrod-Domar model, is significant for bringing about economic growth in disequilibrium conditions.
It needs to be pointed out that when the Harrod-Domar model is suggested for the acceleration of growth in developing countries, one of the prerequisite is that the increase in capital should be associated with productivity growth. This condition "investment associated with productivity growth" implies that there is an increase in the efficiency with which capital is utilised and thereby provides the necessary condition to produce a constant (or better, a declining) capital-output ratio; otherwise an increase in rate of investment (or a declining interest rate) tends to increase the capital-output ratio. This constancy of capital-labour ratio is strategic to the Harrod-Domar model whereby an increase in rate of investment should lead to higher rate of growth of output. 12

SECTION 2.2: NEO-CLASSICAL MODEL

The Neo-classical model of growth, given in the growth model of Solow (1956) shows that the growth of output does not depend upon rate of investment. 13 Given this framework, the rate of growth is determined, entirely by the rate of technological progress in the broadest sense. In other words, a higher rate of investment has no effect upon the rate of growth of the output. This is exemplified in the empirical works of Solow (1957) and Denison (1962) who show that productivity growth, which is independent of rate of
investment, is the factor that accounts for the growth of output.\textsuperscript{14}

The conclusion that investment does not lead to growth is dependent upon two assumptions. First, it is maintained that production process exhibits constant returns to scale with diminishing returns to capital. Second, it is also assumed in the Neo-classical model that the investment behaviour is entirely guided by the saving behaviour in the economy.

In this case, it is shown that an economy that succeeds in increasing its rate of investment would achieve a higher level of output than with the same rate of investment. But it would only yield an increase in the growth rate on a short term basis. In the long-run, the rate of growth, due to an increase in rate of investment, will decrease due to the operation of decreasing returns to capital.\textsuperscript{15} Consequently, the long term growth rate would depend entirely on the rate of growth of productivity. Similarly, this model maintains that if the warranted rate of growth is lower than the natural growth rate, there would be a substitution of factors, i.e., substitution of capital for labour, bringing down the value of capital output ratio. Moreover, the substitution of factors is in line with a higher rate of interest that does not affect investment adversely because the rate of investment is governed by
saving behaviour, independent of the relative factor prices.\textsuperscript{16} In other words, this model maintains that the warranted rate of growth can be increased without an increase in saving rate (investment rate).

It should be emphasised that the investment behaviour assumed is this model is true only in the case of steady-state balanced growth which assumes that there is perfect foresight, without uncertainties or irreversibility and with perfect markets that are permanently cleared. In such a case, capital adapts continuously to change in production in conformity with the saving behaviour of the people.\textsuperscript{17}

However, this study maintains that the need for an increase in growth rate may correspond to a situation of dis-equilibrium where significant price dis-equilibrium exists, i.e., real wage rate for the same unit of labour is different in different sectors of the economy and the future is uncertain. In this situation, asset valuation in line with saving behaviour, that guides desired investment becomes difficult and uncertainties do make investment behaviour an autonomous behaviour, which is distinct and separate from saving behaviour in the economy.\textsuperscript{18} Moreover, price dis-equilibria may reflect excess capacity in different sectors of the economy and different sectors may grow differently at different rates. In this situation, the investment behaviour may be guided by relative profit rate
and be quite distinct from the saving behaviour in the economy.

Further, a departure from balanced growth which is reflected by different sectors growing differently may reflect the fact that investment in one sector is not independent of investments in other sectors of the economy.\(^1^9\) In other words, the production process underlying investment in a sector may have to reckon with various violations of the assumptions about constant returns to scale, for example, increasing or diminishing returns to scale,\(^2^0\) changes in relative prices of products, fall or rise in factor prices due to their greater supply or demand due to overall economic activity, external economies from supply side and availability of technologically superior inputs, to name a few of the factors that have been commented upon in the literature. In this case, the production process may exhibit increasing returns to capital, rather than decreasing returns, as is assumed by the neo-classical model.

In this sense, it can be maintained that under the conditions of disequilibrium, the rate of return on investment and the investment behaviour are not in line with the assumptions of the Neo-classical model; which maintains that investment does not play a role in bringing about economic growth.
SECTION 2.3: IMPORTANCE OF EFFICIENCY OF INVESTMENT IN GROWTH PROCESS

There are studies, mainly empirical in nature, that point to the fact that once efficiency or inefficiency of investment is accounted for, investment is a necessary condition for economic growth. From their standpoint, investment spending has come under increasing criticism on the ground that it is often wastefully applied and does more harm than good. And if capital accumulation is high it does not follow that it leads to higher rate of economic growth. However it cannot be denied that higher investment, if efficiently applied may lead to higher growth.

In literature, there are alternative frameworks to measure investment efficiency. They are discussed below in the following manner.

(a) **Capital Costs:**

In some studies, investment efficiency is a reflection of high rate of investment associated with a reduction in capital costs. To Rosenberg (1976) this amounts to the condition given by an initial demand for capital goods that allow capital producing firms to reap the benefit of economies of specialization. Any improvement in quality, and/or reduction in costs in the capital goods sector constitutes forms of capital saving innovations for the economy as a whole. This technological dynamism aspect of
capital-goods industries maintains the overall marginal efficiency of investment at a high level in line with the increase in aggregate saving rate. A similar conclusion is also reached by DeLong and Summers (1991) who maintain that India's relatively high saving rate is not reflected by a high growth rate because of the fact that equipment is expensive in the country. As a result, equipment investment as a share of GDP is much less than what is suggested by a high saving rate. From their standpoint, according to which equipment investment is crucial, India does not appear to have made good use of its high saving rate.

(b) Incremental Capital-Output Ratio:
In some studies, investment efficiency is measured in terms of incremental capital-output ratio, i.e., decrease in the incremental capital-output ratio shows an increase in the level of investment measured in efficiency units. Increases in investment efficiency, in turn, contribute to economic growth. These findings show that any departure from optimum resource allocation, for example, distortions in product and factor markets, may lead to investment inefficiency; removal of these distortions, accordingly, tends to lead to the acceleration of economic growth.

(c) Productivity Growth:
The third measure of investment efficiency is given in terms of a positive association between investment and
productivity growth. This is reflected by the findings that productivity growth, which explains economic growth, is positively correlated with rate of investment.\textsuperscript{27}

In these studies, the positive association between productivity growth and investment is taken to reflect embodied technological progress.\textsuperscript{28} The embodiment hypothesis shows that investment is important in bringing about a higher rate of growth when capital is a vehicle of technological change. In this sense, investment associated with productivity growth also becomes the necessary condition for achieving a decrease in incremental capital-output ratio.\textsuperscript{29}

It needs to be pointed out that the measure of efficiency both in terms of incremental capital-output ratio and productivity growth are shown to be compatible with steady state equilibrium growth.\textsuperscript{30} For example, an incremental capital output ratio which corresponds to optimum resource allocation is compatible with the maximum steady rate of growth. Similarly, in studies by Leif Johansen (1959), W.E.G. Saltér (1960) and R.M. Solow (1960) it is maintained that in a steady state growth process investment not only leads to higher capital-intensity but also to a faster transfer of new technology into actual production.\textsuperscript{31}
There are studies, on the other hand, in which the importance of embodied technological progress is highlighted in the context of a non-steady growth process. This refers to growth process that involves a structural shift toward technologically advanced sectors in an economy. For example, Mathur (1987) in his study of Indian economy in a national-income framework brings out evidence that among the determining factors of economic growth it is not the growth of saving ratio as such, but the productive channels in which resources are utilised and the consequent pace of growth of key inputs, which are more important (e.g., for industrial growth, they are growth of equipment-making industries, basic metals and power generation). In other words, investment that explains growth is a case when it is associated with faster growth of technologically superior inputs.32

The present work also maintains that investment efficiency is a necessary condition for accelerated economic growth and is given in terms of a positive association between investment and productivity growth. However, the framework adopted in this work leads to the conclusion that (a) investment efficiency is studied mainly in the context of a disequilibrium growth process in which investment does not refer to aggregate investment in the economy but investment in an industry and (b) efficiency of investment
refers to investment behaviour in an industry under the conditions of increasing returns.

The implications of this kind of a representation of investment efficiency are two-fold and are discussed in the following way. First, investment in an industry, being associated with productivity growth is responsible for a higher growth of output in that industry; output growth reflecting contribution of productivity growth. Moreover, this kind of an investment behaviour in an industry also has a positive bearing upon aggregate growth rate. This is because (i) the allocation of investment signifies a change in sectoral structure of resources towards high productive industries, (ii) investment in industries that shows increasing returns is also responsible for investment elsewhere in other industries in the economy by making investment in those industries more profitable. The contribution of these factors on the aggregate growth rate is brought out in the study by Mathur (1987) and also commented upon by Kaldor (1966).

Secondly, it is also maintained that investment associated with productivity growth is responsible for an increase in rate of return in an industry and thereby induces further investment in the industry. This is in line with the studies which maintain that capital accumulation should be accompanied by productivity growth and thereby
lead to an increase in real income. This condition, moreover, is important to underdeveloped countries because the increase in real income, associated with diversification of demand, in turn, is responsible for further increase in investment opportunities. In this perspective, increase in rate of investment which is associated with growth in the industry is not a constraint, which is exogenously given, but is self-financed, i.e., investment associated with productivity growth is responsible for further investment in an industry. This implies that the factors that are responsible for a faster rate of growth in an industry also induce a higher rate of investment; they bring about a higher investment through their effect on the rate of return. It is therefore more correct to maintain as suggested by Kaldor (1968) that "a faster rate of capital accumulation is a symptom of a fast rate of growth than a cause of it".

The framework is to analyse the factors that are responsible for efficiency of investment is taken up in Chapter III.
NOTES

1. There are different ways of setting out the Harrod-Domar model. This study has adopted the approach suggested by Ashok Mathur (1973), pp. 149-150.

2. Ashok Mathur (1973), pp. 150-152


10. In this perspective Harrod-Domar model primarily studies the conditions under which steady state equilibrium growth is possible. Refer to R.M. Solow (1988), chapter 1.


12. For an excellent discussion on this issue, refer to, J. Bruton (1989), pp. 223-229.


15. R. Dornbusch and S. Fischer (1990), pp. 732-733

17. For a discussion on this issue refer to E. Malinvaud (1983), pp. 96. This according to Joan Robinson is 'a mystical state of affairs not likely to obtain in any actual economy', see A.K. Sen (1970), p.227.

18. Once the independent investment function is introduced the growth path of actual output is indeterminate in the sense that it depends on the actual investment behaviour rather than the planned investment in line with desired savings in the economy. Refer to, A.K. Sen (1970),pp. 23-24. For an excellent work to incorporate an independent investment function to trace actual path of output, refer to E. Malinvaud (1983).


20. A.K. Bagchi (1962), pp. 671


24. See, J.B. DeLong and S. L. Summers (1991), pp. 484-485. This view also corresponds to the findings of working group on savings (Chairman K.N. Raj, 1981) in India: to quote,"A closer examination of the estimates of investment in the economy brings out, of course a number of important qualifications that must be made straight away about the extent of increase in the rate of investment itself and the nature of such investments. For instance, part of the apparently large increase in the rate of gross fixed capital formation is traceable simply to the prices of capital goods having risen much more sharply than the prices of other commodities. So, instead of capital goods getting cheaper, they have become dearer". Refer to, Reserve Bank of India (1982), p. 10; also R. Nagaraj (1990), pp. 2324-5.

25. For a review of the literature refer to, B. Balassa (1982),

27. Refer to the study by E.N. Wolff (1987); Also see R.M. Solow (1988), Nobel prize lecture, pp. xxiii-xxiv; Refer also to C.P. Chandrasekhar and A. Sanyal (1991)


33. This issue is discussed in detail in C. Furtado (1989). See, pp.317-323.

34. N. Kaldor (1975), pp. 894-895.