importance of the marketable surplus in a developing economy emanates from the fact that the urban industrial population subsists on it. With the development of an economy, the ratio of the urban population increases and increasing demands are made on agriculture for foodgrains. These demands must be met adequately, otherwise the consequent scarcity of food in urban areas will arrest growth. In case a country fails to produce a sufficient marketable surplus, it will be left with no choice except to import foodgrains which may cause a balance of payments problem.

Untill 1976-77 India was faced with precisely this problem. In most of the years during the earlier planning period market arrivals of foodgrains were not adequate to support the urban population. In order to avert food crisis in cities, the government imported foodgrains in large quantities. This indeed solved the food problem, at the same time, it involved large scale spending of foreign exchange which, if used for other purposes, would have contributed more to the economic development of the country. Hence, ***if some country wants to step up the tempo of indutrialisation, it must not allow its agriculture to lag behind.*** The supply of the farm products particularly foodgrains, must increase, as the setting up of industries in cities attracts a steady flow of population from the countryside. ***Maurice Dobb*** rightly asserts, ***"There is reason to suppose that it will be the marketed surplus of agriculture which plays the crucial role in the underdeveloped country in setting the limits to the possible rate of industrialisation."***[7]

Conditions in foreign trade. The classical theory of trade has been used by economists for a long time to argue that trade between nations is always beneficial to them. In the existing context the theory suggests that the presently less developed countries should specialise in production of primary products as they have comparative cost advantage in their production. The developed countries, on the contrary, have a comparative cost advantage in manufactures including machines and equipment and should accordingly specialise in them. However, in the 1960s, a powerful school under the leadership of Raul Prebisch questioned the merits of unrestricted trade between developed and underdeveloped countries on both theoretical and empirical grounds.

Unlike neo-classical economists, Raul Prebisch looked at the relation between trade and development from the standpoint of balance of payments rather than real resources. He asserted that ***leaving aside some exceptional cases, unrestricted trade results in deficits in the balance of payments of developing countries. In addition, their terms of trade also deteriorate vis-a-vis developed countries. These disadvantages of free trade generally far outweigh any advantage with respect to a more efficient allocation of reasources.***[8]

Foreign trade has proved to be beneficial to countries which have been able to set up industries in a relatively short period. These countries sooner or later captured international markets for their industrial products. Therefore, a developing country should not only try to become self-reliant in capital equipment as well as other industrial products as early as possible, but it should also attempt to push the development of its industries to such a high level that in course of time manufactured goods replace the primary products as the country's principal exports. Both in Japan and Germany in the early phase of their development, exports of manufactured goods had played a crucial role in their economic progress. ***In recent decades, adoption of an export-led growth strategy has enabled countries like the Republic of Korea, Malaysia, Hong Kong and Thailand to register spectacular economic growth.*** However, these experiences are not sufficient to suggest that all less developed countries will inevitably register high growth rates if they adopt trade liberalisation policies. In countries like India the macro-economic interconnections are crucial and the solutions of the problems of these economies cannot be found merely through the foreign trade sector or simple recipes associated with it.[9]

Economic system. The economic system and the historical setting of a country also decide the development prospects to a great extent. There was a time when a country could have a *laissez faire* economy and yet face no difficulty in making economic progress. England's economy was precisely the one in which there was minimal government intervention, and yet it steadily developed over a long period. In today's entirely different world situation, a country would find it difficult to grow along the England's path of development. Japan and Germany had developed in a capitalistic economic system, but their path of growth has not been the same as that of England.

The Third World countries of the present times will have to find their own path of development. They cannot hope to make much progress by adopting a *laissez faire* economy . Further, these countries cannot raise necessary resources required for development either through colonial exploitation or by foreign trade. They now have only two choices before them. First, they can follow a capitalist path of development which will require an efficient market system supported by a rational interventionalist role of the State. The other course open to them is that of economic planning. The latest experiments in economic planning in China have shown impressive results.

Non-Economic Factors in Economic Development

From the available historical evidence, it is now obvious that non-economic factors are as much important in development as economic factors. In the following pages, we attempt to explain how they exercise influence on the process of economic development.

Human resources. Population is an important factor in economic development. Economists often see it as an obstacle to growth rather than as a factor which will assist the developmental activity. Nevertheless, man makes positive contribution to growth. Man provides labour power for production and if in a country labour is efficient and skilled, its capacity to contribute to growth will decidedly be high. The productivity of illiterate, unskilled, disease ridden and superstitious people is generally low and they do not provide any hope to development work in a country. It is now well known that if a country can manage to use its manpower properly, it will certainly prove to be an important factor in development. But in case human resources remain either unutilised or the manpower management remains defective, the same people who could have made a positive contribution to growth activity prove to be a burden on the economy.

Technical know-how and general education. It has never been doubted that the level of technical know-how has a direct bearing on the pace of development. As the scientific and technological knowledge advances, man discovers more and more sophisticated techniques of production which steadily raise the productivity levels. Schumpeter was deeply impressed by the innovations done by the entrepreneurs, and he, in fact, attributed much of the capitalist development to this role of the entrepreneurial class. Since technology has now become highly sophisticated, still greater attention has to be given to Research and Development for further advancement. If a country in modern times neglects this activity, it will have to pay a heavy price in terms of industrial underdevelopment.

Under assumptions of a linear homogeneous production function and a neutral technical change which does not affect the rate of substitution between capital and labour, Robert M. Solow has observed that the contribution of education to the increase in output per man hour in the United States between 1909 and 1949 was more than that of any other factor.[10] T.W. Schultz,[11] A.K. Sen[12] and some others in the recent years have emphasised the contribution of investment in man for economic development. They all, however, find its quantitative measurement rather difficult. And, in fact, whatever results have been so far obtained in this regard are at best tentative.

Political freedom. Looking to the world history of modern times one learns that the processes of development and underdevelopment are interlinked and it is wrong to view them in isolation. We all know that the underdevelopment of India, Pakistan, Bangladesh, Sri Lanka, Malaysia, Kenya and a few other countries, which were in the past British colonies, was linked with the development of England. England recklessly exploited them and appropriated a large portion of their economic surplus. This made a significant contribution to Britain's economic development. The colonies, however, were forced to remain backward in the process. Similarly France's development was linked with the underdevelopment of Algeria and Indo-China, the Netherlands' development with the underdevelopment of Indonesia and the USA's development with the underdevelopment of Latin American countries. In fact, one cannot be correctly understood if viewed separately from the other. Andre Gunder Frank has marshalled unquestionable evidence in support of his contention that the underdevelopment of Brazil and Chile cannot be explained in any other way except in terms of the US exploitation of these countries.[13]

Social organisation. Mass participation in development programmes is a pre-condition for accelerating the growth process. However, people show interest in the development activity only when they feel that the fruits of growth will be fairly distributed. Experiences from a number of countries suggest that whenever the defective social organisation allows some groups to appropriate the benefits of growth, the general mass of people develop apathy towards State's development programmes. Under the circumstances it is futile to hope that masses will participate in the develoment projects undertaken by the State. India's experience during the whole period of development planning is a case in point. Growth of monopolies in industries and concentration of economic power in the modern sector is now an undisputed fact. Furthermore, the new agricultural strategy has given rise to a class of rich peasantry creating widespread disparities in the countryside. Most people think that these facts are sufficient to prove that India's social organisation is anything but just. Hence it is not at all surprising that there is widespread apathy towards development planning in this country.

Corruption. Corruption is rampant in developing countries at various levels and it operates as a negative factor in their growth process. Until and unless these countries root out corruption in their administrative system, it is most natural that the capitalists, traders and other powerful economic classes will continue to

exploit national resources in their personal interests. Furthermore, a substantial portion of the outlay on development projects is appropriated by the government officials and other funtionaries by employing corrupt means. The regulatory system is also often misused and the licences are not always granted on merit. The art of tax evasion has been perfected in the less developed countries by certain sections of the society and often taxes are evaded with the connivance of the government officials. Under such conditions it is futile to hope that the business activity will be smooth and the pace of development will be fast.

It is, however, surprising that one finds hardly any reference to corruption as a growth arresting factor in the literature that has appeared on development and underdevelopment in recent years. Gunnar Myrdal is very critical of this approach. In his opinion, it is rather unfortunate that in the post-World War II period economists have deliberately chosen to ignore the fact of corruption in their analysis of development problems in the backward economies.[14] According to Myrdal, two main reasons are responsible for such a state of affairs. In the first place, there is diplomacy in economic research. Secondly, the use of Western models which do no represent the concrete reality in developing countries has blurred the perspective.

Desire to develop. Development activity is not a mechanical process. The pace of economic growth in any country depends to a great extent on people's desire to develop. If in some country level of consciousness is low and the general mass of people has accepted poverty as its fate, then there will be little hope for development. Richard T. Gill has candidly remarked, "The point is that economic development is not a mechanical process; it is not a simple adding up of assorted factors. Ultimately, it is a human enterprise. And like all human enterprises, its outcome will depend finally on the skill, quality and attitudes of the men who undertake."[15]

Natural Resources

Until the 1930s development or underdevelopment of economy was often explained in terms of the relative quantities of natural resources available. Jacob Viner, William J.Baumol and W.A. Lewis are some of the leading economists who attach great importance to natural endowments of a country for its development. Jacob Viner has stated, "Much obviously depends on the character of the physical environment, or the 'quantity', in my terminology, of the natural resources considered as factors of production... An unfavourable physical environment can be a major obstacle to development."[16] Indeed industrial development and business activity in a number of countries may be associated, among other things, with the kind and size of the resource base they have.

Availability of fertile soil with abundant supply of water for irrigation purposes provides favourable conditions for agricultural development. Similarly, adequate reserves of coal and petroleum and water resources for electricity generation can be profitably utilised by an underdeveloped country for its transformation into a developed economy. Minerals like iron ore, copper, tin, bauxite, and uranium, if avialable in plenty, can induce the process of industrialisation. Sea coast provides navigation facilities necessary for overseas trade. As it has happened in Japan and Scandinavian countries, coast can prove to be a source of abundant supply of fish. Without these resources there is not much hope for economic growth.

The natural endowments of a country place general limits on the possibilites of economic growth. However, resource availability is not a sufficient condition for human progess. A number of countries in Latin America, Africa and Asia are favourably endowed with natural resources, yet their achievements in terms of economic progress are rather disappointing. Many parts of the world which are presently underdeveloped, are poor in terms of natural resources. Cases of Afghanistan and Tibet are often cited to prove that lack of natural resources can turn out to be major obstacle to development. But this point should not be stretched too far, as man often succeeds in overcoming the problems arising from the scarcity of natural resources. Switzerland, for example, has scarcely a single physical advantage for development, yet in wealth per capita it ranks as high as Germany, Britain and the USA which are rich in their physical endowments.

Furthermore, the relative role of natural resources in economic growth of a country tends to decline as an economy grows. Theodore Schultz has pointed out that the ratio of the natural resources to the complex of all resources used in poor countries is about 20 to 25 per cent as against 5 per cent or even less in developed industrial countries.[17]

GROWTH MODELS—THE POST KEYNESIAN PHASE

In the classical theory it is assumed that the economic system equilibrates at full employment. The rate of increase in per capita output is then broadly determined by how rapidly capital accumulation takes place relative to the growth of labour force and how rapidly technical progress manages to offset diminishing returns.

Keynes' *General Theory* emphasized that full employment is not automatically achieved. Since Keynes limited his analysis to short-run, he was able "to impound into *ceteris paribus* all those phenomena and characteristics of an economy that change more slowly than the immediate determinants of income. The short-run mechanism is assumed to work itself out in a setting in which capital stock, technology, market habits, saving habits, social and cultural environment, population etc., remain unchanged. With all these given, the problem was to determine the equilibrium level of income."[18] However, despite its orientation towards the short-run problem, Keynes' theory did help in reviving the interest in long-run growth problems, and over the past seven decades the literature on this subject has grown rapidly. The first attempt to extend Keynesian short-run theory into a growth problem was essentially to examine the effects of changes in the capital stock on the behaviour of income.

Since investment leads to a change in the capital stock, it seems resonable to define equilibrium so that it involves the capital stock. ***Keynesian equilibirium requires equality between desired savings and desired investment, while the growth form of the model requires for equilibrium the continuing maintenance of the desired ratio between capital stock and the rate of output.*** In the early formulations, this ratio seems to be determined solely by technological considerations, *i.e.* it is a tchnological constant. ***The earliest models on these lines were developed by Roy F. Harrod and Evesy D. Domar.***[19] The models of these two economists helped in bridging the gap between Keynes' short-run static theory of employment and the dynamics of long-run growth. The conclusions arrived at by Harrod and Domar are very similar in nature and it is customary to consider their models together and give them a single name 'the Harrod-Domar Model'. This model is generally taken as a starting point of all discussion on modern growth theory since it is a simple and formal one—well suited to serve as a framework into which additional elements can be introduced one by one until it becomes as complex as the present state of growth itself. In fact, the body of contemporary capitalist growth theory consists of a series of extensions and modifications of the Harrod-Domar model. Such modifications have helped us to considerably improve our understanding of problems of stability and instability, and of the role of technological change in the context of the long-run growth prospects of the capitalist system.

THE HARROD-DOMAR MODEL—STEADY STATES AND STABILITY

The theory of economic growth attempts to describe essentially advanced, industrialized economies. Hence, capital and labour are the two inputs upon which attention is focussed. Land is generally ignored, but technical progress is crucial . Because of its basic concern with advanced economies, the theory of economic growth is also primarily concerned with the discussion of steady states and stability. In fact, as stated by Joseph E. Stiglitz and Hirofumi Uzawa,"steady states are to growth theory what perfect competition and monopoly are to the theory of the firm."[20] By studying these states, one can learn a great deal about the growth process itself. If the economy converges with reasonable speed to the steady state, they the steady state becomes directly relevant empirically. As would be clear from a discussion of the models of Harrod and Domar the concern of both of these economists is with steady-state growth and the conditions necessary for the economy to maintain its growth along the steady-state growth path.

In his model, Harrod considers three rates of growth — ***the warranted rate (G_w), the natural rate (G_n) and the actual rate (G).***

Warranted rate of growth has been defined as the rate of growth of investment and output at which the expanding capital stock will remain fully utilized over time. It is the rate of growth that will result in investors' expectations being *realized or warranted* — all investment exactly fully utilized. If '*s*' is the constant proportion of income devoted to savings and '*v*' is the capital-output ratio, *G* is defined as *s/v.*

Natural rate of growth is the maximum rate of growth allowed by the increases of population, accumulation of capital, technological improvement and the work/leisure preference schedule, supposing that there is always full employment in some sense. Therefore, the natural rate of growth is the highest rate of growth that is permanently maintainable.

Steady growth requires both $G = G_w$ and $G = G_n$, i.e., $G_w = G_n$.

Both Harrod and Domar, however, argued that it is unlikely that the warranted rate and the natural rate will be equal since they are both determined by independent factors (as shown above G_w depends on the propenstiy to save and the relationship between capital stock and productivity while G_n, which is basically the rate of growth of labour, depends on demographic conditions). Therefore, the probability that expansion will take place along the one *knife's edge* or *razor's edge* expansion path that maintains full utilization of labour and capital is extremely small. In general, full-employment steady growth would not be possible.

If the natural rate is greater than the warranted rate, the economy will actually grow at the warranted rate. However, the growth rate will be inadequate to absorb the natural increase in the labour force, and hence, unemployment will be an ever-increasing problem. In this case, the rate of capital accumulation will be lower than the rate of growth of the labour force, and accordingly, the capital stock will be inadequate to employ the nation's labour force. Now consider the case where the warranted rate exceeds the natural rate. In this case, to maintain full employment, aggregate demand must grow faster than economy is actually able to grow. Increases in labour force and productivity are inadequate to produce the required growth of output. As a result, the economy cannot grow at the warranted rate. The steady state equilibrium growth path represented by Harrod-Domar model is clearly a difficult path for the economy to follow. To obtain and maintain a knife's edge balance as demanded by this model is very difficult.

The pessimistic predictions of the knife's edge model of Harrod and Domar stem from the restrictive assumptions taken by these economists. The basic assumptions of Harrod-Domar model are as under : (1) A constant proportion (s) of income (Y) is devoted to savings. (2) The amounts of capital and of labour needed to produce a unit of output are both uniquely given implying a situation of fixed coefficients in production. (3) The labour force grows over time at a constant rate G_n, fixed by non-economic, demographic, forces. It is also assumed that there are constant returns to scale, and no technical progress.

▮▮▮▮▮ THE NEO-CLASSICAL MODEL ▮▮▮▮▮

Relaxing the Assumption of Fixed Coefficients of Production

By relaxing one or more of the above mentioned restrictive assumptions, growth theorists have tried to eliminate the razor edge rigidity of the Harrod-Domar model. For instance, Solow, Swan and Meade in their models relaxed the assumption of fixed coefficients in production. Instead, they postulated that capital and labour are substitutes. Therefore, production can take place with an unlimited number of different capital to labour ratios. This implies that the capital-output ratio v is adjustable, instead of being fixed. This provides a way in which s/v (the warranted rate) and G_n (the natural rate) can be brought into equality and the steady-state growth of the economy ensured. The models of Solow, Swan and Meade fall under the category of the Neo-Classical Models of Growth.

To illustrate how steady-state growth can be maintained in a neo-classical model, consider a position where the warranted rate of growth exceeds the natural rate of growth, *i.e.*, $s/v > G_n$. In this case, the economy tries to break through the full employment barrier, thereby making labour more expensive *vis-a-vis* capital. This induces shifts to labour-saving techniques. Such shifts increase the capital-output ratio and this pulls down the value of s/v. This happens until s/v coincides with G_n. Thus, substitution of capital in place of labour makes it possible for unwarranted rate of growth to became equal to the natural rate of growth.

If $s/v < G_n$, the labour will be increasing at a more rapid rate as compared to the warranted rate. This implies a situation of increasing unemployment leading to a fall in real wage rate *vis-a-vis* the real interest rate. Naturally, more labour-intensive techniques will be employed. This will reduce v, thereby raising s/v. This goes on until s/v equals the natural rate of growth G_n.[21]

The above discussion shows that ***steady-state stability is assured in the neo-classical model by a simple adjustment mechanism, namely the possibility of substitution between capital and labour.*** Therefore, the neo-classical theory argues that any tendency for the capital stock to grow more or less rapidly than population can be avoided by choosing a method of production of the appropriate capital intensity.

Changes in Saving Propensity: The Cambridge Models

Another class of economists has considered the adjustment between the warranted rate (s/v) and the natural rate via changes in s, i.e. the saving propensity. The models of Kahn, Kaldor, Joan Robinson, Kalecki and Pasinetti fall under this category. In general, the models of these economists are known as the Cambridge Models of Growth. In their theories, the saving propensity can vary leading to a change in the warranted rate of growth. The saving propensity in the models of Kaldor and Robinson depends essentially on the distribution of income between workers and capitalists. Income can be divided into two categories, Wages(W) and Profit (P) and total savings into savings of workers (S_w) and savings of capitalists (S_p).Then

$$Y = W + P$$

and

$$S = S_w + S_p$$

If the propensities to save of workers and capitalists are given by s_w and s_p respectively, while the overall propensity to save is, as usual, given by s, we obtain from $S = S_w + S_p$ the following result

$$sY = s_w W + s_p P$$

or

$$s = s_w + s_p$$

$$= s_w \left(1 - \frac{P}{Y}\right) + s_p \frac{P}{Y}$$

$$= s_w + (s_p - s_w) \frac{P}{Y}$$

Dividing both sides by v, we get

$$\frac{s}{v} = + \frac{s_p - s_w}{v} \cdot \frac{P}{Y}$$

Since s/v is the warranted rate of growth, the above equation implies that the warranted rate of growth must be equal to $\frac{s_w}{v} + \frac{s_p - s_w}{v} \cdot \frac{P}{Y}$. This warranted rate of growth must be equal to natural rate G_n if

$$G_n = \frac{s_w}{v} + \frac{s_p - s_w}{v} \cdot \frac{P}{Y}$$

As is clear from above, the burden of adjusment here falls upon *P/Y*. Therefore, ***in this simple presentation of Kaldor, the warranted rate of growth will adjust itself to the natural rate of growth if profit margins are flexible.*** This, of course, implies imposing some restrictions on the permissible combination of values of v, G_n, s_p and s_w.

Mrs. Joan Robinson also makes capital accumulation depend explicitly on the profit-wage relation (π and w/p) as well as on labour productivity (ρ). The equation arrived at is

$$\frac{\Delta K}{K} = \pi = \frac{\rho - \frac{w}{p}}{\theta} \qquad ...(1)$$

where $\frac{\Delta K}{K}$ indicates the rate of growth of capital, (ρ–w/p) indicates the net return to capital, and θ is the capital-labour ratio. This equation shows that the rate of growth of capital is capable of increasing if the net return to capital increases in greater proportion than the the capital-labour ratio. This means that ***if technological conditions remain unchanged (i.e., ρ and θ remain constant), capital accumulation is stregthened by a fall in the real-wage rate and weakened by a rise in the real-wage rate.*** What is clear is that the rate of growth of capital is dependent on 'whatever' determines the profit rate (π).

Joan Robinson terms the Harrodian steady-state equilibrium (warranted rate = natural rate = actual rate) as a ***'golden age.'*** In this case fully employed labour grows at the same rate as the rate of growth of capital. This implies that capital must grow as fast as labour population. Therefore $\frac{\Delta N}{N} = \frac{\Delta K}{K}$ depicts a golden age equilibirium. A condition of disequilibrium implies that either $\frac{\Delta N}{N} > \frac{\Delta K}{K}$ or $\frac{\Delta K}{K} > \frac{\Delta N}{N}$. In the former case, labour population is increasing at a faster rate than capital accumulation leading to a situation of progressive underemployment. This, in turn, pushes down money wage rate (w) of the workers. If the general price level (p) remains constant, the real wage rate (w/p) will also fall.

If this happens, rate of growth of capital can increase since the profit rate would tend to increase as indicated by equation (1) . In such circumstances, the rate of growth of capital would increase to catch up with the constant rate of growth of labour population so as to make $\frac{\Delta K}{K} = \frac{\Delta N}{N}$.[22] The other possibility is that $\frac{\Delta K}{K} >$

$\frac{\Delta N}{N}$, *i.e.,* capital accumulation grows faster than labour population. The possiblity of returning to the path of 'golden age' equilibrium is greater here because even if the real-wage rate were rigid, a change in labour productivity (ρ) or in the capital-labour ratio (θ) might well be such as to increase the profit rate and hence the rate of growth of capital, as would be clear from equation (1).

Adjustment via Changes in the Rate of Population Growth

We have so far discussed two possibilities of adjustment between the warranted rate (s/v) and the natural rate (G_n)—the Neo-Classical possiblity that v is adjustable and the Cambridge possiblity that s is adjustable. There can be a third possibility also and that is that the natural rate G_n itself changes and becomes equal to the warranted rate. This possibility was considered by Haavelmo, Solow, Leibenstein, Jorgenson, Kaldor and some other economists.

The central hypothesis here is that the rate of growth of labour force, G_n, is an increasing function of the real wage, w. The relationship can be of the form $G_n = (w - \overline{w})$ where is the 'subsistence' level of income at which the population is stationary. G_n may be subject to an upper limit , the 'biological maximum'. Other possible refinements are to make the function non-linear approaching asymptotically; to make it reverse its direction above a certain level of w; or to make n depend on income per head rather than the wage. All of these have been suggested.[23]

As noted by Hahn and Mathews, models of the above type, where the rate of growth of the labour force is a variable have a two-fold significance: (1) In the first place, they can show the working of economic influences on mortality and fertility, as in the original Malthusian theory; (2) In the second place, and perhaps more important, they provide a link between 'the theory of growth' and 'the theory of development' through the notion of 'unlimited supplies of labour' (using Lewis's phrase) avialable from a backward sector of the economy. An important feature of the underdeveloped countries is the existence of 'dualism'. An advanced and a backward sector co-exist, and in the course of development labour flows into the advanced sector, until in a fully advanced economy the backward sector becomes vestigial.[24] A number of theories using this concept have been developed during the last few decades.

The first important concern in the context of underdeveloped countries is with the developmental strategy. Nurkse's theory of balanced growth and Hirschman's theory of unbalanced growth stem precisely from this basic concern with developmental strategy. Here the importance of external economies and complementarities is weighed against the husbanding of scarce decision-making resources. Likewise, Rosenstein Rodan's 'big push' and Leibenstein's 'critical minimum effort' theories concern themselves with the need to overcome the gravitational pull of stagnation by means of a concentrated attempt at breakout over a relatively short period of time. Arthur Lewis was the first to advance the crucial behaviouristic assumption of an 'unlimited' supply of labour, based on the existence of an institutionally-anchored real wage and stating the conditions under which the transfer of the underemployed agricultural labour force could be effected. However, as noted by Gustav Ranis, "Lewis's attention was focussed mainly on the creation of the required labour supply curve, but he paid relatively little attention to the agriculture sector and to the causes of that upturn and its implications for the dynamics of the reallocation process."[25] In their own model, Ranis and Fei have sought to follow this up by examining the development problem in terms of the complete interaction between the two sectors in the course of the development effort.

THE ROLE OF TECHNICAL PROGRESS

In addition to the three possibilities of bringing about an adjustment between warranted rate of growth and natural rate of growth, *viz.* changes in s, changes in v, and changes in G_n, there is a fourth possibility as well. This is the possibility of technical progress. In the simplest treatment technical progress is regarded as something that goes on at an externally given rate and serves to bring about an increase over time in the output that can be produced by any combination of factors of production. Its effects can then be separated conceptually from those of capital accumulation, even when the two are going on at the same time. If technical progress is of this kind and is 'Harrod-neutral', its effects are closely analogous to those of population growth. This is due to the reason that under Harrod-neutral technical progress, the efficiency of the labour force improves and, accordingly, each man can do more work than before. Whereas "population growth increases the labour force,

Harrod-neutral technical progress increases the labour force measured in efficiency units. Population growth causes there to be two men where there was previously one; Harrod-neutral technical progress causes one man to be able to do twice what he could have done previously."[26] Such a technical progress can create conditions that permit steady growth. If technical progress is not Harrod-neutral, there cannot normally be steady growth. Under the broad heading of technical progress, a number of possibilities can be considered. Each possibility can give rise to a different gowth model. Such discussion lies beyond the scope of the present book.

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22. Obviously this equilibrating mechanism will not work if real wages fail to fall either because money wages are rigid or because price level falls in the same proportion as money wages. In such a case, 'progressive underemployment' cannot disappear. This would result in indefinite instability — a condition similar to Harrod's notion of instability.
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UNIT 3

Anatomy and Functioning of An Economy

"The current IMF type adjustment package is wide in scope and targeted towards the requirements of fiancne capital ... adjustment in its present form is nothing more than the macroeconomics of international financial oligarchy."

— C.P. Chandrasekhar

CHAPTER

9 MACROECONOMIC FRAME-WORK—BASICS

Circular Flow of Income in an Economy
• Simplified Two-Sector Model • Introduction of Government • Circular Flow of Income in a Modern Four-Sector Economy
• Leakages and Injections in the Circular Flow
Keynes' Theory of Employment and Income
• The Principle of Effective Demand • Meaning of Effective Demand and its Determination • The Equilibrium Employment
• Expected Proceeds and Actual Proceeds

Until the publication of Keynes' *The General Theory of Employment, Interest and Money* in 1936, little attempt was made to analyse the working of the economic system as a whole. Commenting upon the state of affairs Robert L. Heilbroner has aptly remarked, "It was, rather, typical of a kind of myopia that affected all economists in those days. Hence, when the economic mechanism came to a grinding halt in the Great Depression, the result was not only an immense social tragedy but an absolutely numbing intellectual shock."[1]

Since the Great Depression a significant change has occurred in the approach of the economists towards economic questions. They now enquire into the working of the economy as a whole. Rudiger Dornbusch and Stanley Fischer state, ***the present day macroeconomics "is concerned with the behaviour of the economy as a whole— with booms and recessions, the economy's total output of goods and services and the growth of output, the rates of inflation and unemployment, the balance of payments, and exchange rates."***[2]

Right till the 1930s when the Great Depression struck the US and European economies forcing large number of business firms and financial institutions into bankruptcy the belief in the rational working of the market went unchallenged. The Great Depression exposed the weakness of the clasical economic theory to grapple with the economic realities of the world. At this juncture, John Maynard Keynes in his magnum opus *The General Theory of Employment, Interest and Money* provided an alternative theory of the determination of employment and output which explained why the operation of market forces did not ensure that aggregate demand would automatically be that which was necessary for full employment. The appearance of Keynes' book was hailed as 'Keynesian revolution' and "with the ferment begun by ideas in Keynes' book, economists' relative neglect of macroeconomic theory ended."[3] On account of this reason, most of the economists agree that the genesis of macroeconomics is to be found in Keynes' work.

Today, macroeconomics is a well developed branch of Economics. It addresses itself to the following two central problems of the economy:

(*i*) How are national income and employment levels determined at a particular point of time and why do the economies pass through the phases of boom and depression during a specific period of time?
(*ii*) What are the laws of economic development?

Managers of modern corporate enterprises know that these issues are very much relevant to their growth and prosperity.

In an attempt to understand the basics of macroeconomics we are required to discuss the following :

- Circular flow of income in an economy.
- Keynes' theory of employment and income.

CIRCULAR FLOW OF INCOME IN AN ECONOMY

Anatomy of an economy is better understood by knowing the circular flow of income. In modern economies production is carried out mainly for the purpose of sale in the market. Sales generate a flow of money incomes out of which payments are made to the factors of production for the services rendered by them. Therefore, in a modern economy, processes of production and exchange generate the following two kinds of flows: Firstly, business firms demand services of the various factors of production which are supplied by the households. After completing of the production process, goods and services are sent to the market for disposal and are sold to the households. Thus ***there is a circular flow of goods and services between the households and the business firms. Economists call it the real flow. The other kind of circular flow between firms consists of money flows. Firms pay in cash for goods and services they receive from the households. From the money incomes so generated households purchase goods and services from the business firms.***

Introduction of Government

In this section, we shall first discuss the circular flow of income assuming that there is no government and no international economic relations (*i.e.,* the economy is a 'closed' economy). In this simplified macroeconomic model, there are thus only two sectors—households and firms. We shall then expand our model first to include government (making it a three-sector economy) and then international sector (making it a four-sector economy).

Simplified Two-Sector Model

In a simplified two-sector model consisting only of households and firms, we may first assume that there is no saving. However, we start by assuming that there is a certain degree of monetisation of the economy. Obviously, a household cannot produce all goods and services it requires. Certain commodities have to be purchased from other producing units, which we call firms in our analysis. In other words, no household exists as an economically isolated unit. Therefore, ***there is a flow of consumer goods from the firms to the households. There is also a corresponding flow of income from the households to the firms.*** The national accounting system tells us that the national income is by definition equal to the national expenditure. This implies that in a two-sector model of an economy total expenditure of the households is exactly the same as the total factor earnings of the households.

Also, as current sales are exactly equal to current level of production, whatever incomes flow to the business firms are disbursed to factors of production as wages, rent, interest and profits. Therefore in our simple economy the circular flow of money and incomes ***will remain constant as long as the households keep on spending all their incomes on consumer goods and the firms keep on paying all the money collected from the sale of their products to households as wages, rent, interest and profit.*** However, in reality it is difficult to find an economy where circular flow of income remains constant. Withdrawal of income from the flow (which is known as a *leakage*) reduces the flow while introduction of income into the flow (which is known as *injection*) increases it.

In the foregoing analysis of the circular flow of money and incomes in the two-sector economy we have assumed that all the households in the society spend their total earnings on consumer goods and services. This never happens in actual life.

In any society within a given time period whatever part of income is not spent on consumer goods and services, is called ***saving***. Symbolically, saving can be defined as follows:

$$S = Y - C$$

where Y is income, C is consumption and S is saving.

The relationship between saving and consumption revealed from the above equation implies that an act of saving in any society automatically reduces the consumption expenditure and thus the circular flow of money and incomes declines. When people handover their savings to banks and other financial institutions, which in turn advance loans to business firms, the money withdrawn from the circular flow due to saving once again comes back to it. Some households often hoard a part of their incomes which is a leakage of income from the circular flow and is thus accompanied by a fall in the income level.

Investment refers to expenditure on goods which are not consumed directly, but help in the production process. Therefore, firms' expenditure on plant, machinery, finished goods and inventories will be considered as investment. Households do not incur expenditure on these items. For this purpose they obtain funds from

the capital market or may borrow from banks, insurance companies or special industrial financing institutions. They may also use their retained earnings for investment purposes. These activities result in an addition to the circular flow of incomes and the level of income rises by the amount of investment.

Savings of the households reach the capital market in some form or the other where firms borrow funds for investment purposes. It is noteworthy that those who undertake investments are generally not the poeple who save. While savings are done by the households, investments are undertaken be the firms. Therefore, ***saving and investment in any economy need not necessarily be equal.***

Whenever saving exceeds investment (S > I), the income flow declines. Conversely, if investment exceeds saving (I > S) the income flow increases. Thus the level of income will not be in equilibrium, if the saving and investment in an economy are not equal. The implication of investment being larger than saving is that whatever income leaks out from the circular flow in the form of saving is more than neutralised by an injection in the form of investment. This pushes up the level of income and, after a certain time lag, saving and investment become equal to each other at a higher level of income.

Introduction of Government

In a modern economy the government performs a wide variety of economic functions. Therefore a government generally raises its revenue from a number of sources; taxes being one of the most important ones. A government levies taxes both on households and business firms. Taxes which are levied on the households are called personal taxes (denoted as T_1). The taxes levied on business enterprises are denoted as T_2. The total revenue proceeds of the government (denoted as T) thus will be equal to the sum of the revenue proceeds from the two sources. In symbolic form

$$T = T_1 + T_2$$

A government spends the money collected through the taxes on various heads. Administration, justice, defence, etc. take away a large portion of the government revenue. Huge amounts are spent on development plans and welfare activities.

Presently, revenue and expenditure policies of the government are influenced by the neo-classical approach. The neo-classical economics maintains that the government expenditure should not exceed its revenue. If the government maintains a balanced budget, the amount of income taken out of the circular flow as taxes will be exactly replaced through government expenditure. However, some of the modern governments do not maintain a balanced budget. Nowadays deficit in budgets is a normal phenomenon which is generally covered by loans. ***Whenever the government's budget is not balanced, there may be a flow of income between the government and the capital market. If the tax revenue of the government is less than the public expenditure (T < G), the government will have to borrow from capital market and this will cause a flow of money from the capital market to the government. Conversely, if the government's tax revenue is more than the expenditure (T > G), there may be a flow of money from the government to the capital market.*** However, this may rarely happen. If the surplus revenue is retained by the government and not spent in any manner, the circular flow of income will decline.

Circular Flow of Income in a Modern Four Sector Economy

Nowadays almost all countries maintain trade relations with one another. This fact cannot be ignored while discussing flow of income. It is obvious that if a country undertakes imports *(M)* from other countries, the amount spent on imported goods by the households is received by the factors of production in the exporting countries. Such expenditure is not productive from the point of view of the creation of national income in the importing countries. For example, if Indian households buy watches of foreign make, instead of HMT, Titan or any other Indian brand, and their demand is satisfied by importing these watches, then income of the factors producing watches abroad will go up, while the income level in India will fall. To sum up, whatever may happen to money expenditure on foreign goods at a later stage, it is to be recognised that ***imports invariably cause an outflow of income from the circular flow of income.***

If the country exports goods (*X*), an income flow is created for the factors of production engaged in manufacture of exported goods. It is obvious that the residents of the country do not incur expenditure on exported goods. As in this case the country receives money incomes equal to the amount of exports, circular flow of income goes up. Thus, ***exports cause an inflow of income into the circular flow of income.***

Countries generally desire that their foreign trade should be a balanced one. However, in practice this does not happen quite often. ***Whenever imports of a country exceed its exports (M > X), or we may say that***

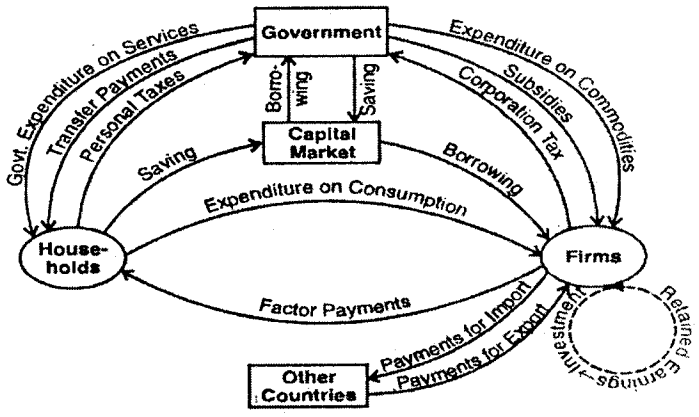

FIG 9.1. Circular flow of income in a Modern Economy

the country has an unfavourable balance of trade, there will be leakage of income equal to the amount of deficit in foreign trade (M – X) from the circular flow of income. Conversely, when imports are less than exports (M < X), the circular flow of income goes up by the amount of surplus in the balance of trade (X – M). We have shown circular flow of income in a four-sector economy (also known as an open economy) in Figure 9.1. The readers will find it self-explanatory.

Leakages and Injections in the Circular Flow

In our discussion of the circular flow of income one would notice that leakages and injections are not completely divorced from each other. We all know that the people who save and the people who invest are generally not the same, but the major portion of the national income that is invested in the business sector is the one that is saved in the household sector. Similarly whatever part of the national income government collects through taxation, is used by it for meeting its various expenditures. In the foreign sector also one finds that exports and imports are related to each other. If we assume that the amount invested in the country is equal to the amount saved, government spends only the amount it collects from taxes, and exports and imports and equal to each other, then leakage of income from the circular flow will be equal to injection into it. In other words, circular flow of income will remain at a constant level.

For stability in the circular flow of income it is not necessary that leakages and injections in various sectors of the economy should be equal to each other at the sectoral level. The only condition which has to be fulfilled is that saving, tax revenue and imports which are leakages should be equal to investment, government expenditure and exports constituting injections into the circular flow of income. This, in fact, is a sufficient condition for stability in the circular flow of income. In symbolic form this condition may be stated as follows:

$$S + T + M = I + G + X$$

If the leakages from the circular flow are less than injections, the expansionist forces will start operating in the economy raising the level of income. As a result of this, saving, revenue proceeds from taxes and imports will go up. Eventually this expansion process of economy will come to a stop when leakages will once again equal injections. In case leakages exceed injections in the circular flow, the contractionary process will begin and income level will decline. This will reduce saving, tax collections, and imports. This process will continue unhindered till leakages decline to a level that they once again become equal to the injections in the circular flow.

KEYNES' THEORY OF EMPLOYMENT AND INCOME

The theory of employment and income determination which today constitutes the core of modern macroeconomics, was first developed by John Maynard Keynes in *The General Theory of Employment, Interest and Money* in 1936. Keynes' theory has been subjected to several empirical tests since then, and in the light of new results, attempts have been made to make it more realistic and general. Before the publication of the *General Theory* almost everybody in academic circles uncritically accepted the classical theory which stated that a capitalist economy due to its built-in system operate at full employment and the level of income corresponds to it.

Although the classical economists admitted the possibility of frictional and voluntary unemployment, they ruled out the possibility of involuntary unemployment. J.M. Keynes, rejecting the classical theory, held that in the Western capitalist economies, involuntary unemployment is a normal phenomenon, and thus, the actual national income in such a country remains invariably less than that could be realised, had the economy operated at full employment.

After completely demolishing the classical theory, Keynes developed his own theory of employment and income. His theory, though mostly based on *a priori* reasoning, has been found to be empirically sound. The chief merit of Keynes' theory is that it explains the working of an economy, irrespective of the level of employment. As a matter of fact, his theory is as much valid to analyse involuntary unemployment, as for explaining the full employment situation.

The Principle of Effective Demand

The principle of effective demand occupies a strategic position in Keynes' theory of employment, According to Dudley Dillard, ***"The logical starting point of Keynes' theory of employment is the principle of effective demand. Total employment depends on total demand, and unemployment results from a deficiency of total demand. Effective demand manifests itself in the spending of income. As employment increases, income increases."***[4]

Now we shall examine Keynes' theory of employment and income in respect of a two-sector model. In other words, the assumption is that the economy has no trade with foreign countries and the government of the corntry does not perform any economic function. Thus, spending will be possible either in the form of consumption or investment. By adding up the two spendings, we will know the aggregate demand, which in its turn will determine the level of employment and income. ***As the real income of a country rises, its consumption also increases. The rate of increase in consumption will be lower than that of income. It is for this reason that an increase in investment has to be equal to the increase in saving, if income has to be maintained at the higher level.*** Any shortfall in investment will not only bring down the level of income, it will also create involuntary unemployment. Any excess of investment over saving will initiate a process whereby levels of employment and income will rise. This is the core of the principle of effective demand.

Meaning of Effective Demand and Its Determination

Keynes' theory of employment is part of modern macroeconomic analysis. According to his analysis, ***the level of employment and income in any society depends upon the size of effective demand which, in turn, is determined by the equilibrium of aggregate demand and aggregate supply.*** It is, therefore, necessary for us to understand the meaning of the two determinants of effective demand.

Aggregate Demand Function. In the theory of the firm in microeconomics, demand for a firm or industry refers to a schedule of various amounts of commodity which will be purchased at a series of prices. The amounts of the commodity are expressed in terms of physical units. In macroeconomics wherein we are concerned with the entire economic system, the output cannot be measured in terms of any such simple physical measure. In his theory, Keynes uses the amount of labour employed as a measure of the output as a whole. ***The aggregate demand 'price' for the output of any given amount of employment is the total sum of money, or proceeds, which is expected from the sale of the output produced when that amount of labour is employed.***[5]

If D are the proceeds which entrepreneurs expect to receive from the employment of N men, the relationship between D and N written as $D = f(N)$ is called the aggregate demand function.[6] This implies that as the level of employment rises, the output increases and the proceeds from the sale of output become larger. Summarising the whole position, we may thus state that the aggregate demand 'price' will increase as the employment expands, and it will fall as the employment contracts. However, it will be wrong to presume that increase in aggregate demand is proportionate to increase in employment and output. ***Aggregate demand if considered from the economy's point of view is expected expenditure which does not rise proportionately in response to increase in employment, output and income. Generally when output increases as a result of expansion in employment, aggregate demand also increases but at a diminishing rate.*** This explains why the slope of aggregate demand curve *(AD)* diminishes as it moves upward to the right.

Let us now consider Figure 9.2. In this diagram, *AD* is the aggregate demand curve. It starts from the point of origin which implies that at zero level of employment, output is ruled out and thus producers do not expect any receipts. In other words, at zero level of employment, aggregate demand is also nil. At *ON* level of employment there is a positive amount of output and expected proceeds from it amount to *OR*. Using a

different expression we say that expected expenditure or aggregate demand is *OR*. When employment level rises to ON_1 aggregate demand increases to OR_1. A careful perusal of the diagram clearly reveals that aggregate demand rises in response to an increase in employment but the increase in former is not proportionate to increase in the latter. A further rise in employment taking it to ON_2 level again induces an increase in aggregate demand, but once again aggregate demand grows at a diminishing rate. Because of this tendency the slope of aggregate demand curve *(AD)* as shown in Figure 9.2 goes on declining as it moves upward to the right.

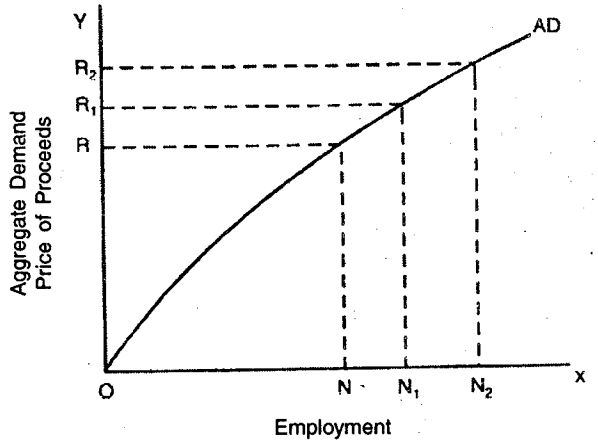

Fig. 9.2. Aggregate Demand Curve

Aggregate Supply Function. In a capitalist society, production is organised for profit making. Hence, producers will employ workers in a number that maximises their profits. The total number of men employed in the whole economy is the total or aggregate of those employed by all producers. The aggregate supply price can be defined as follows: To induce producers to offer any given aggregate amount of employment, a certain minimum amount of proceeds will be necessary. This minimum price or proceeds which will just induce employment on a given scale is called the aggregate supply price of that amount of employment.[7]

The aggregate supply function is a schedule of the minimum amounts of proceeds required to induce varying quantities of employment. Now let Z be the aggregate supply price of the output from employing *N* workers, then the relationship between Z and *N* can be expressed as $Z = g(N)$. We may call it aggregate supply function.

It is clear that at a relatively lower level of employment, output will also be less and resulting cost will be small. Hence, the expected minimum proceeds required by the producers to induce that level of employment will also be small. As employment expands and results in larger output, total cost also increases and it is quite natural that producers expect correspondingly higher minimum amounts of proceeds.

The shape of aggregate supply curve depends entirely on technical conditions of production. In other words, the shape of aggregate supply curve is decided by the manner in which cost rises in response to expansion in employment. For our analysis we may assume that technical conditions of production are given. On the basis of this assumption we may state three main characteristics of the aggregate supply curve: (1) ***Whatever be the area of production marginal cost is inevitably positive, and therefore, aggregate supply curve must move upward in response to expansion in employment.*** (2) Quite often when production is expanded, relatively less efficient units of different factors of production are used, or the optimum ratio between different factors of production is disturbed, or the production is carried out under the condition of diminishing returns to a factor or diminishing returns to scale. Sometimes all the three factors operate together. ***When production is increased by expanding employment, cost increases at an increasing rate on account of these factors and, as a consequence, the slope of aggregate supply curve continuously rises. (3) Under the conditions of full employment (in Figure 10.3 OF represents this position) production cannot be expanded by raising the cost. In case an attempt is made to this effect, the employment and output levels will not change, only the cost will rise which implies that aggregate supply curve will assume a vertical shape.***

In Figure 9.3, *AS* is the aggregate supply curve. It starts from the point of origin. The reason for this is that at zero level of employment the level of output is also zero and thus the costs which producers wish to recover or the minimum proceeds which they expect will also be nil. The aggregate supply curve (*AS*) steadily moves upward to the right and finally becomes vertical on reaching the full employment level.

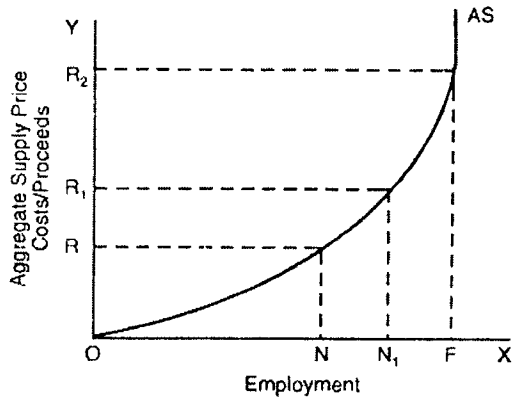

Fig. 9.3. Aggregate Supply Price

The Equilibrium Employment

When we place the aggregate demand schedule and the aggregate supply schedule side by side, we find that for certain levels of employment, proceeds expected exceed the proceeds necessary to induce a given volume of employment. Then there are other levels of employment for which the proceeds expected are insufficient to induce the producers to offer those amounts of employment. In between, ***there will be some level of employment for which the amount of proceeds expected is just equal to the aggregate supply price. The economy, according to Keynes, will be in equilibrium at this level of employment.*** In Figure 9.4 the amount of employment is given by the point of intersection between the aggregate demand function (*AD*) and the aggregate supply function (*AS*). At this point the producers expect to maximise their profits. ***The point of intersection E of aggregate demand function and aggregate supply function is known as the point of effective demand.*** At this point the volume of employment will be equal to ON_1. This is not necessarily full employment. When employment level is *ON*, the aggregate demand price is OR_2 while the aggregate supply price is only *OR*. Hence, from the point of view of employment it is not an equilibrium position. Likewise if employment level is higher than ON_1 aggregate demand price and aggregate supply price will be at variance. At any level of employment higher than ON_1, aggregate demand price will be lower than aggregate supply price. Hence, producers will not be willing to employ more workers than indicated by ON_1. It is to be noted that so long aggregate demand price is higher that aggregate supply price the process of employment expansion goes on. Conversely, when aggregate supply price exceeds aggregate demand price, employment level shows a tendency to fall. In fact, employment equilibrium is attained only when aggregate demand curve and aggregate supply curve intersect each other.

A level of employment, other than one given by the point of intersection between the aggregate demand function and the aggregate supply function will not optimise profits of the entrepreneurs. Hence, the economy

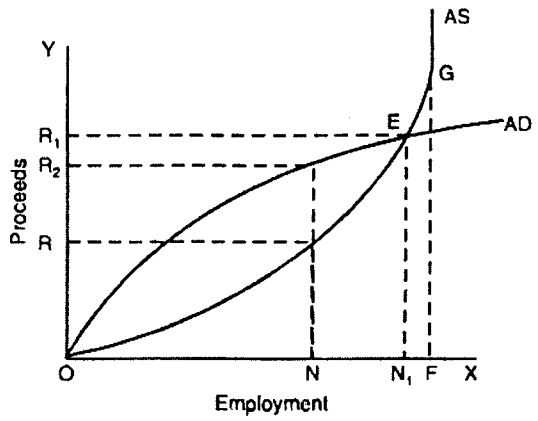

Fig. 9.4. Determination of the Effective Demand and Employment

will not reflect any tendency to move away from this point, whatever be the degree of unemployment in this position. Keynes has asserted that there is no reason to assume that this situation will be characterised by the complete absence of involuntary unemployment. Only in periods of extreme prosperity, which are rare, a country should hope to find itself at full employment level. In such a case, the point of intersection between the aggregate demand function and the aggregate supply function will correspond to the full employment level. In Keynes' theory, full employment is important only as a limiting case, because beyond it both output and employment are unresponsive to increases in the effective demand.

Expected Proceeds and Actual Proceeds

The above argument suffers from a serious limitation for it implicity assumes that the expectations of the producers turn out to be hundred per cent correct in all cases. In other words, we have suggested that actual aggregate demand turns out to be precisely the same which the entrepreneurs had expected. In reality, things are different. Very often the actual proceeds from the sale of the output are less than what the producers expect. In such a case the actual aggregate demand curve and the expected curve will be at variance. Figure 9.5 shows the expected aggregate demand curve D as well as the actual aggregate demand curve D_1. The point of intersection between the expected aggregate demand curve D and the aggregate supply curve Z gives us ON level of employment. In our example, expectations are, however, not fulfilled. The actual aggregate demand being lower than the anticipated demand, ON employment level is not realised. The point of intersection between D_1 and Z gives us ON_1 level of employment. This will be in accordance with the reality. The entrepreneurs in view of lower actual aggregate demand will continually revise their expectations until expected proceeds become equal to the actual proceeds. The expected aggregate demand curve thus becomes D_1 and the equilibrium level of employment will be ON_1.

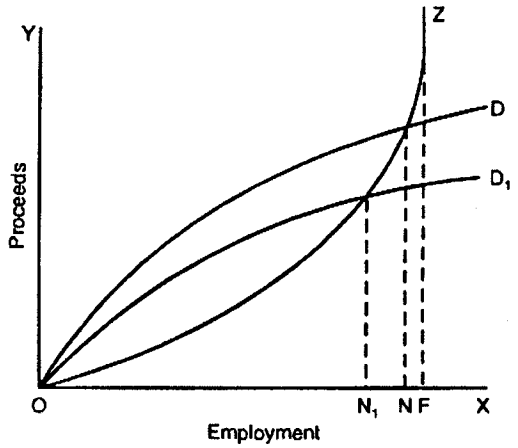

Fig. 9.5. Determination of the Level of Employment when Actual and Expected Proceeds Differ

We were so far concerned with the actual and equilibrium levels of employment. The equilibrium level of employment was seen to be the outcome of the interplay of the forces underlying aggregate demand and aggregate supply. Economists are unanimous that there is not much that is novel in Keynes' aggregate supply function. The essence of Keynes' theory is to be found in his treatment of the aggregate demand function. In a simple two-sector model, ***aggregate demand is made up of two components: (i) consumption expenditure (C) and (ii) investment expenditure (I). The consumption demand depends on the size of income (Y), and the propensity to consume (C/Y).*** According to Keynes, there is a fairly stable proportion for any level of income which will be spent on consumer goods by the people. Let us take the example of a country whose people as a whole spend Rs. 450 million when their national income is Rs. 500 million. The average propensity to consume at this point is 0.9.

The effective demand for investment usually refers to the demand for machinery and other capital goods. But investment may also take the form of additions to the stock of finished goods in the hands of producers and traders. ***Most investments are made by the producers with the expectations that they will turn out to be profitable. The expected profitability of the new investment is called the marginal efficiency of capital.*** According to Keynes, ***the inducement to invest is determined by the marginal efficiency of capital in relation***

to the rate of interest on money borrowings for investment purpose. Marginal efficiency of capital depends on profitability expectations and the replacement cost of capital assets. Keynes developed the concept of marginal efficiency of capital because he thought that the conventional term 'marginal productivity of capital' failed to emphasize the dynamic setting in which expectations of investors establish a link between the present and the future. Rejecting the classical theory of interest as indeterminate, Keynes developed his own theory. For him, interest is a monetary phenomenon. The rate of interest depends upon two factors, *viz.*, the state of liquidity preference and the quantity of money.

BOX 9.1 : Summary of Keynes' Theory of Employment (N)

1. Employment (N) depends upon effective demand.
2. Effective demand is determined by the aggregate demand function and the aggregate supply function.
3. The aggregate supply function being relatively stable, employment will largely depend upon aggregate demand.
4. The aggregate demand is made up of two parts, *viz.*, consumption (C) and investment (I).
5. The consumption depends upon the propensity to consume and the size of income. The propensity to consume is relatively stable.
6. The propensity to consume remaining stable, the employment depends upon the volume of investment.
7. The volume of investment depends upon the marginal efficiency of capital and the rate of interest.
8. The marginal efficiency of capital depends upon the expectation of profit yields and the replacement cost of capital assets.
9. The rate of interest depends upon the state of liquidity preference and the quantity of money.

NOTES

1. Robert L. Heilbroner, *Understanding Macroeconomics,* p. 7.
2. Rudiger Dornbusch and Stanley Fischer, *Macroeconomics* (McGraw-Hill International Book Company, 1985), p. 3.
3. Edward Shapiro, *Macroeconomic Analysis* (Harcourt Brace Jovanovich Inc., Fourth Edition, 1978), p. 3.
4. Dudley Dillard, *The Economics of John Maynard Keynes* (London: Crosby Lockwood & Sons Ltd., 1950), p. 29.
5. *Ibid.*. p. 30.
6. J.M. Keynes, *The General Theory of Employment, Interest and Money* (London: MacMillan, 1936), p. 25.
7. Dudley Dillard, *op. cit.,* p. 31.

CHAPTER

10 CONSUMPTION AND INVESTMENT

The Consumption Function
• Constant MPC with Declining APC • Consumption Function • Keynes's Consumption Function
Empirical Estimation of Consumption Function
• The Consumption Function Puzzle • The Relative Income Hypothesis • The Permanent Income Hypothesis • The Life Cycle Hypothesis
The Investment Function
• The Concept of Investment • The Investment Decision
Estimating the Profitability of Investment Projects
• Present Value of the Capital Asset • Expected Rate of Return or The Marginal Efficiency of Capital
The MFC Schedule and the Rate of Investment
• Shape of the MEC Curve • Determination of Real Investment Equilibrium • Characteristics of the MEC Schedule • Business Expectations and the MEC • Capital Stock and the Rate of Investment : The Concept of MEI

While discussing Keynes' theory of income and employment we have stated that the volume of employment in a society depends on the level of effective demand, which in turn is determined by the aggregate demand function. In a two-sector model the aggregate demand, as already discussed, is made up of two components, *viz.*, the consumption expenditure and the investment expenditure. In this chapter, in an attempt to explain the two components of aggregate demand we address the following questions:

1. What is meant by the consumption function? Is it correct to think that the most common consumption function is the constant MPC with a declining APC consumption function?
2. What are the relative income hypothesis, the permanent income hypothesis and the life cycle hypothesis? Do these hypothesis resolve the consumption function puzzle?
3. What is the concept of investment? How are investment decisions taken?
4. How is MEI to be distinguished from MEC?

THE CONSUMPTION FUNCTION

Whatever be the society, the main purpose of every economic activity, be it production or exchange, is consumption. Most people spend a major part of their income on commodities which satisfy their wants directly. It is this behaviour of people that motivates them to produce.

Let us now understand at the outset as to what determines our consumption. Just as in microeconomic theory, price is singled out as the primary determinant of the quantity taken, in macroeconomic theory Keynes singled out income as the main determinant of consumption. This relationship is expressed in the form of a function. Thus, ***the consumption function is the assumed direct relationship between the national income level and the planned or desired consumption expenditures.*** Algebraically the basic relationship between country's consumption spending and its national income is shown as

$$C = f(Y)$$

in which

C stands for the consumption spending, and

Y stands for the national income.

When consumption function is written in this form, it is suggested that the level of consumption varies with the size of national income. It is, however, not assumed that income is the sole determinant of consumption expenditure. Many subjective as well as objective factors influence consumption expenditure. Writing consumption in the form $C = f(Y)$ assumes only that the influence of other factors is of little consequences due to stability in them.

According to Keynes, while increase in income is accompanied by increase in consumption, yet the rate of increase in consumption is invariably less than the rate of increase in income. Keynes has called this tendency as the ***Psychological Law of Consumption***. Keynes most probably never used any statistical information to discover this fundamental law. He relied mainly on general observation and deductive reasoning to discover the functional relationship between income and consumption. In Keynes' analysis what is called income is in fact disposable income. Keynes' Psychological Law of Consumption has been empirically tested in the recent decades by a number of economists.

In his analysis of consumption function, Keynes has used two important concepts—***the average propensity to consume (APC) and the marginal propensity to consume (MPC).*** Average propensity to consume refers to the proportion of a country's national income that is devoted to consumption. Marginal propensity to consume refers to the proportion of each small addition to the level of a country's national income that will be devoted to additional spending on consumer goods.

According to Keynes, MPC is invariably positive, but its value remains less than 1. Hence, $0 < b < 1$ that is b (MPC) shall lie between 0 and 1.

In macroeconomic analysis, economists usually refer to three relatively common consumption functions:

(*i*) The constant MPC and constant APC consumption function,

(*ii*) The constant MPC with a declining APC consumption function, and

(*iii*) The declining MPC consumption function.

Constant MPC with Declining APC Consumption Function

This is probably the most common consumption function. J.M. Keynes has referred to it in his *General Theory* when he stated that "men are disposed, as a rule and on an average to increase their consumption as their income increases, but not as much as the increase in their income."[1] ***Empirical investigations have also revealed that the most common individual consumption function has the property that the MPC remains constant whereas the APC falls continuously.***

Algebraically, the relationship of this form of consumption spending to the level of national income is as follows:

$$C = a + bY,$$

where

$$a > 0 \text{ and } 0 < b < 1$$

In the equation a stands for the minimum level of consumption spending in a country when it fails to generate any national income, b is the same as in earlier consumption function. This equation thus states that the consumption spending in a country is equal to some minimum expenditure on consumer goods at zero income level, plus some proportion of each addition to the country's level of national income. When income rises in such a country, the consumption also increases and its amount is determined by the various subjective and objective factors.

With the help of an example we can explain how the foregoing equation depicts the relationship between the level of income and the level of consumption. Let us assume that in a country minimum consumption at zero level of income is Rs. 30 crore and the MPC which remains stable throughout is 0.75. Thus the consumption function of this country is C = Rs. 30 crore + 0.75 Y. Now we can easily find amounts of consumption spending corresponding to various levels of national income. If the national income in a country is Rs.100 crore, its consumption spending will be Rs. 105 crore (30 + 0.75 × 100 = Rs. 105 crore); if it is Rs. 200 crore, Rs. 180 crore (30 + 0.75 × 200 = Rs. 180 crore) will be spent on consumption. Consumption spendings corresponding to various levels of national income are shown in the consumption function schedule given in Table 10.1.

TABLE 10.1. Consumption Function Schedule ($C = a + bY$)

Amount of National Income Y (Crores of Rs.)	*Amount of Consumption C (Crores of Rs.)*	$APC = \frac{C}{Y}$	$MPC = \frac{\Delta C}{\Delta Y}$
0	30		
100	105	1.05	0.75
200	180	0.9	0.75
300	255	0.85	0.75
400	330	0.825	0.75

This consumption function ($C = a + bY$) has been depicted in Figure 10.1. The linear form of the aggregate consumption curve clearly indicates that the MPC is constant throughout, whereas the APC declines continuously. Moreover, at all the levels of income the APC is higher than the MPC, or (APC > MPC). For example, if the level of income is Rs. 100 crore, the APC is 1.05 or 105 per cent, whereas the MPC is 0.75 or 75 per cent. Likewise at an income level of Rs. 300 crore, the APC is 0.85 while the MPC remains 0.75.

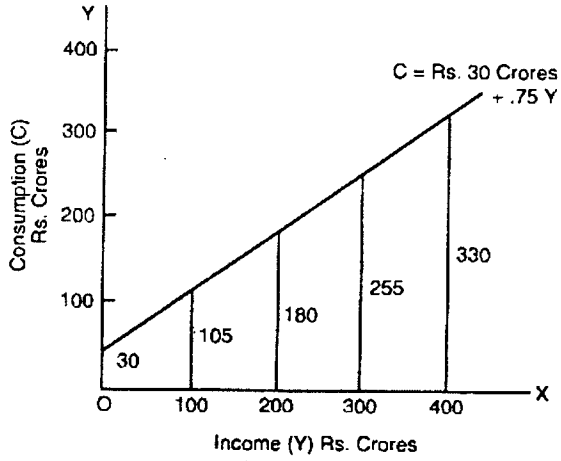

FIG 10.1. Consumption Function ($C = a + bY$)

Keynes's Consumption Function

We have stated earlier that there are three possible consumption functions. J.M. Keynes, who made the first attempt to describe an economy's consumption function, emphasised the following points:

1. The real consumption expenditure is a stable function of the real income.
2. The marginal propensity to consume (b) is positive and irrespective of the level of income, it must be less than one, or
$$0 < b < 1$$
3. The average propensity to consume declines with rising income and thus the marginal propensity to consume is less than the average propensity to consume, or
$$APC > MPC$$
4. The marginal propensity to consume itself declines as the income rises, or
$$Y \uparrow \frac{\Delta C}{\Delta Y} \downarrow$$

Keynes was not very sure about the last point and it was not essential to his argument. Nonetheless, post-Keynesian empiricists have shown great interest in the nature of marginal propensity to consume. They wanted to verify whether the marginal propensity to consume declined, as the income rose. Economists today are aware of the significance of a declining marginal propensity to consume. ***In an economy where marginal propensity to consume reflects this trend, it is increasingly difficult to increase spending to keep pace with rising***

productive capacity. In other words, such an economy will relapse into stagnation, unless the investment expenditure grows progressively.

EMPIRICAL ESTIMATION OF CONSUMPTION FUNCTION

The consumption function as discussed by Keynes had no time dimension. Moreover, although he did provide a bit of statistical evidence in support of his consumption hypothesis, his consumption function was based essentially on *a priori* reasoning. Even his 'psychological law of consumption' which states that as income increases, consumption also increase, but by a somewhat smaller amount, was based on intuition. However, if a model is to be applied to reality, its statistical estimation is a must. This is why a number of economists after Keynes tried to estimate the consumption function on the basis of empirically available data. As economists undertook this exercise, they found conflicting results when they looked at the relationship between consumption and income over a long period of time and when they looked at the relationship between consumption and income over a shorter period of time. Similarly, they found differences between time series data (which implied looking at the relationship between consumption and income over a period of time) and cross-sectional data (which implied looking at the relationship between consumption and income in different areas/regions at one moment of time).

The Consumption Function Puzzle

Study of long-term time series data for the US economy over the period 1948-84 suggested that the average and marginal propensity to consume were equal at somewhere between 0.9 and 1. The long-run consumption function was of the type

$$C = 0.9\ Y_d \qquad \ldots(1)$$

(where Y_d stands for disposable national income)

This would imply that the consumption function goes through the origin but is very close to the 45 degree line (which would imply a situation where consumption equals income). This result did not fit into Keynes' discussion of the consumption function.

The short-run time series data and the cross-sectional data were consistent with Keynes' belief that the consumption function has a positive intercept and a lower than average marginal propensity to consume. The short-run time series data for the US economy covering the period 1929-41 yielded the following consumption function (at 1954 prices):

$$C = 26.5 + 0.75\ Y_d \qquad \ldots(2)$$

Dividing both sides by Y_d, we get

$$\frac{C}{Y_d} = \frac{26.5}{Y_d} + 0.75$$

This equation yields the following results: (*i*) MPC is positive and less than one (as it is 0.75 here) and (*ii*) APC declines with rising income (as Y_d increases, the value of the right hand side, and hence APC, falls). Both these propositions are strikingly consistent with Keynes' hypothesis. Not only this, the marginal propensity to consume was also observed to be less than the average propensity to curve (which declined from 1.015 in 1933 to 0.88 in 1941). The only hypothesis of Keynes on which nothing could be said is that the marginal propensity to consume declines with rising income.[2]

The studies of US national income for the period 1869-1938 conducted by Simon Kuznets contradicted Keynes' consumption hypotheses. For instance, dividing the entire period 1869-1938 into three overlapping 30-year periods—1869-1898, 1884-1913, and 1904-1933, Kuznets estimated the average propensity to consume and found it to be nearly the same in all of them (the APC was 0.867 both in 1869-1898 and 1884-1913 and 0.879 in 1904-1913). Thus using long-term averages, the results of Kuznets suggest that there is little variation in the ratio of consumption to income and, in particular there is no tendency for the average propensity to decline as disposable income rises[3].

As is clear from the above discussion, there is a clear discrepancy between the long-run consumption function as given by equation (1) and the short-run consumption function as given by equation (2) on the one hand, and between the implications of equation (2) and the findings of Kuznets on the other hand. For instance, while the findings of Kuznets suggest that the average propensity to consume is constant over long periods, equation (2) suggests that it falls as income rises.

To resolve the consumption function puzzle and to reconcile the different empirical estimates of the long-

run and short-run consumption functions, a variety of hypotheses have been suggested. The three most important hypothesis are:

1. The relative income hypothesis
2. The permanent income hypothesis
3. The life cycle hypothesis

These are discused below rather briefly :

The Relative Income Hypothesis

This hypothsis was put forward by James Duesenberry in 1952. According to Duesenberry, the current consumption depends not only on present income, it also depends on present income relative to peoples' past income. Specifically, he argued that individuals build up their consumption standards that are geared to their peak income levels previously attained. Thus ***individuals' consumptions decisions are based both on their current income and their past income peak. If income declines relative to past income, the individuals will not immediately sacrifice the consumption standards they have adopted in the past and will try to maintain them.*** There is a *ratchet effect,* and they will adjust only to a small extent to decline in current income. As a result, short-run marginal propensities will increase with a decrease in income and it will look as if the consumption function is flatter. However, there is an asymmetry, because an increase in income relative to past peak levels immediately raises the consumption level. Thus in this case the ratchet effect does not work.

Duesenberry's theory attempts to smooth consumption in the face of income fluctuations and has an intuitive appeal in its emphasis on consumption standards geared to past peak income level. However, it did not predict empirically well and was viewed essentially as an *ad hoc* addition to Keynes' theory. Thus it was not integrated into the Keynesian model. As against this, the other two hypotheses discussed below were integrated into the Keynesian model giving a specific temporal interpretation to it.

The Permanent Income Hypothesis

This hypothesis was put forward by Milton Friedman in 1957. He argued that ***people gear their consumption behaviour to their permanent or long-term consumption opportunities, not to their current level of income.*** To illustrate, let us consider a person who receives his income once a week (say Monday). We do not expect this man to spend all the income that he receives on a particular Monday on that day itself, with zero consumption on every other day. He is likely to divide his expenditure over the entire week. Thus, consumption on any particular day of the week would be unrelated to income on that particular day but would rather be geared to average daily income. It is clear in this extreme example that income for a period longer than a day is relevant to the consumption decision on a particular day. Similarly, Friedman argues that there is no compulsion for an individual to plan consumption in a specific period only on the basis of the income that accrues within that period.[4] Instead, consumption is generally planned in relation to income over longer period. ***The long-term income is the permanent income.***

The gist of the permanent income hypothesis that emerges from the above discussion is that people base their consumption on their expected stream of income or the present value of their future income and not on their income in a specific year. The appropriate variable to use in a consumptin function is not income but wealth and the current consumption depends upon the interest rate and the expected future level of income, as well as present income. For example, if a person earns a higher income in 2007 but does not expect it to continue he will save a large portion of it. However, if he expects the income to remain high well into the future as well, he will increase his consumption by a larger amount than if he would had the rise been a windfall gain only. Friedman splits both income and consumption into temporary (transitory) and permanent components so that

$$Y = Y_p + Y_w \qquad C = C_p + C_w$$

where Y and C are measured income and consumption, Y_p and C_p are permanent income and consumption and Y_w and C_w are transitory (windfall) income and consumption. The transitory components are wholly unpredictable and uncorrelated with any of the other variables so that their expected value is zero[5]. Thus the true consumption-income relation is assumed to be between permanent consumption and permanent income according to the function

$$C_{pt} = k\, Y_{pt}$$

where C_{pt} and Y_{pt} are permanent consumption and permanent income at time t. The coefficient k is the marginal propensity to consume. As is clear from the equation above, permanent consumption varies in the same proportion as permanent income. Since permanent income should be related to long-run average income, this

feature of Friedman's consumption functions is clearly in line with the observed long-run constancy of the consumption-income ratio. Economists have evolved techniques to measure permanent income and thus estimate the consumption function.

The Life Cycle Hypothesis

At about the same time that Friedman advanced his permanent income hypothesis, Franco Modigliani and Albert Ando suggested the life cylce hypothesis. The idea contained in this hypothesis is very similar to that contained in permanent income hypothesis as it argues that people will base their consumption on their life time income, and not the present income. ***The basic idea of the life cylce hypothesis is that consumption plans are made so as to achieve a smooth or even level of consumption by saving during periods of high income and dissaving during periods of low income. Thus whereas under Keynesian consumption function only current income was considered, in life cycle hypothesis, the whole future profile of income enters into the calculation of lifetime consumption.*** Young persons in initial years of their career tend to have a high MPC as their income levels are low. As they grow older and become middle aged, their income rises. Out of this income they save a larger proportion partly to pay off past debts and partly to accumulate assets for retirement. Thus their MPS rises and MPC falls. When retirement arrives and brings with it a reduction in income, savings become negative.

The essence of the life cycle hypothesis is expressed as follows: ***"People do not want to consume over their lifetimes at precisely the same times and amounts they earn income. Thus they save and dissave so as to consume their lifetime incomes in the pattern they want. Typically, the theory argues, they will save while working, and then use the savings to finance spending in their retirement years."***[6]

▮▮▮▮▮ THE INVESTMENT FUNCTION ▮▮▮▮▮

Investment has always occupied a crucial position in all macroeconomic theories. This is not only true of Keynesian and post-Keynesain theories, but also of pre-Keynesian business cycle theories. This is possibly due to the fact that ***aggregate investment expenditure constitutes a highly volatile component of aggregate demand.*** During periods of prosperity, investment expenditure is at a very high level but sinks to inordinately low levels during the period of depression. In fact, during depression investors become reluctant to incur expenditure even for replacing the depreciated capital equipment. In the following pages, we propose to discuss the factors which determine planned investment expenditure in an economy.

The Concept of Investment

In modern macroeconomic analysis, the term 'investment' refers to *real investment.* A firm invests when it uses steel and other materials to build a new warehouse or when it purchases a new machine. Steel, machines and similar capital goods are part of the *real* output of the economy. In common parlance, when a person deposits money in his savings account in a bank or buys the shares of a company we say that he has 'invested' his savings. Undoubtedly, this is invested in a *financial form* but it is not a real investment as it does not lead to any addition to the physical stock of capital bur merely implies a transfer of financial resources. This discussion shows that ***investment implies real investment, i.e., addition to the existing stock of real capital assets, such as business construction (say, the construction of new factories, new office buildings etc.), building of plant, equipment and machinery, and additions to inventories (stock of goods).***

As is clear from the above definition, investment is used as a synonym of capital formation. Therefore, it excludes all expenditure on previously existing assets, and stands for expenditure on current additions to the nation's durable equipment and stocks of materials and products.[7]

In practice, investment expenditure is incurred in the private as well as the public sector. But in a two-sector model, to which we have confined our study, investment in the government sector is not taken into account. We assume that whatever be the investment expenditure in an economy, it has to be made by the firms in the private sector alone. The investment expenditure in the private sector usually takes the following forms:

(*i*) Real planned investment in fixed capital, particularly the capital equipment (excluding buildings).

(*ii*) Real planned investment in buildings.

(*iii*) Real planned investment in inventories.

The Investment Decision

Although in a modern capitalist economy substantial investment is made in the public sector, we assume

in our simple model that all investment decisions are taken by firms (or more strictly by the enterpreneurs who own and manage the firms). We further assume that the entrepreneurs do business only to earn profits and they wish to maximize them. In the analysis of the investment function our problem, therefore, is to explain how a profit maximising firm will plan its investment.

Unlike the buyer of a commodity who can easily find out his surplus by comparing the utility that he derives form the commodity with its price, an investor always faces certain difficulties in calculating the yield on a capital good. In the first place, all capital goods last long and the yields on them are usually spread over several years. Since these returns lie in the future, an investor can never know them. He can only estimate them which will, as a matter of fact, depend on his expectations. Moreover, he cannot know the economic life of the capital equipment even if he knows its physical life. This is so because the economic life of a plant or machinery depends considerably on the rate of technological change which can never be accurately predicted. Hence, the investor will have to estimate this too. Secondly, any calculation of yield must allow for the fact that returns spread over a number of years are worth less than the same amount now. The investor's problem thus will be to make yields spread over the economic life of the capital good comparable to its cost.

ESTIMATING THE PROFITABILITY OF INVESTMENT PROJECTS

For the purpose of estimating the profitability of investment projects we may calculate:

either (1) present value of the capital asset,

or (2) the discounted rate of return.

Present Value of the Capital Asset

When a firm wants to make investment in some machine, it has to compare the *present value* of the machine (V) with its *actual supply price* (C). The cost of replacing the machine under consideration with a brand new machine is known as its supply price. The sum obtained after discounting the expected future yields over the entire life of the machine at the market rate of interest is known as the present value of the machine.

To understand how present value is calculated let us suppose that Rs. Q are invested for one year at the rate of interest i per cent, compounded annually. Thus at the end of the year we would get Rs. $i\,Q$ as interest which, with the return of the principle Q, would give us $Q + iQ = Q\,(1 + i)$ rupees. If the initial sum is designated as Q_0 and the sum at the end of one year as Q_1, then we get the expression

$$Q_1 = Q_0\,(1 + i) \qquad ...(1)$$

If Q_0 is invested for another year, we would get

$$Q_2 = Q_1\,(1 + i)$$

after 2 years, However, since $Q_1 = Q_0\,(1 + i)$, it follows that

$$Q_2 = Q_0\,(1 + i)^2$$

If Q_0 is invested for 3 years, we would get

$$Q_3 = Q_0\,(1 + i)^3$$

after 3 years, and so on. In general, if Q_0 is invested for t years, we would get

$$Q_t = Q_0\,(1 + i)^t \qquad ...(2)$$

after t years.

Now, consider equation (1) again. This can be written as

$$Q_0 = \frac{Q_1}{1+i}$$

Here $\frac{1}{1+i}$ is known as the *discount rate*. $\frac{Q_1}{1+i}$ is the *discounted present value* of Q_1 receivable one year from today. For example, if the rate of interest were 10 per cent, $i = 0.10$ and the discount rate is $\frac{1}{1+0.10} = \frac{1}{1.10}$. Thus we would conclude that Rs.100 receivable at the end of one year has the present value of Rs.

$\frac{100}{1.10}$ = Rs. 90.91 because with 10 per cent market rate of interest, Rs. 90.91 would grow to Rs. 100 in one year.

From equation (2) it can be seen that the present value Q_0 of Q_t available t years hence is given by

$$Q_0 = \frac{Q_t}{(1+i)^t}$$

To illustrate, let us suppose that a firm hopes to earn Rs.13,310 after a period of 3 years and the market rate of interest is 10 per cent. The present value would then be given by

$$Q_0 = \frac{Q_3}{(1+i)^3} = \frac{13,310}{(1.10)^3} = \text{Rs. } 10,000$$

i.e., Rs. 10,000 invested today, at the rate of 10 per cent per annum, would yield Rs.13,310 at the end of 3 years.

In general, let us suppose that $R_1, R_2, R_3 \ldots\ldots, R_n$ are the yields of the asset whose present value is to be estimated and P is its disposal value. Then the present value of that asset is given by

$$PV = \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \cdots + \frac{R_n}{(1+i)^n} + \frac{P}{(1+i)^n}$$

Let us now work out a concrete example. A firm has the following data:

1. The cost of the machine is Rs. 50,000
2. The excepted useful economic life of the machine is 5 years
3. Its estimated disposal value is Rs. 16,094.1
4. The annual expected returns spread over 5 years are Rs. 16,094.1
5. The market rate of interest is 10 per cent per annum.

The present value of the machine is given by

$$PV = \frac{16,094.1}{1.10} + \frac{16,094.1}{(1.10)^2} + \frac{16,094.1}{(1.10)^3} + \frac{16,094.1}{(1.10)^4} + \frac{16,094.1}{(1.10)^5} + \frac{16,094.1}{(1.10)^5}$$

$$= \text{Rs. } 14,631 + 13,301 + 12,092 + 10,993 + 9,994 + 9,994 = \text{Rs. } 71,005$$

Since the discounted present value Rs. 71,005 is greater than the cost of the machine Rs. 50,000, this investment is profitable.

Expected Rate of Return or the Marginal Efficiency of Capital

An alternative method that can be used by the investor is that he calculates the expected rate of return over the supply price of the machine and compares it with i, the rate of interest on which loanable funds will be available to purchase it. He discounts the gross returns in different years and also the scrap value of the machine, so that the sum of these discounted returns plus the discounted scrap value just equals the supply price. The rate of discount which makes the present value of the series of annual returns expected from the capital assets over its life exactly equal to its supply price is known as the marginal efficiency of capital. It is precisely in this sense that Keynes used this term in his *General Theory*. He wrote: "I define the marginal efficiency of capital as being equal to that rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price."[8]

This definition can be expressed in the following terms

Supply Price = Discounted Prospective Yields

or
$$C = \frac{Q_1}{(1+r)} + \frac{Q_2}{(1+r)^2} + \frac{Q_3}{(1+r)^3} + \cdots + \frac{Q_n}{(1+r)^n} + \frac{P_n}{(1+r)^n} \qquad \ldots(3)$$

where C stands for the supply price of the capital assets, $Q_1, Q_2 \ldots Q_3$ stand for the yields on the asset in years 1, 2..., n, r stand for the marginal efficiency of capital (or the rate of discount) and the last term on the right hand side of the equation has been added to indicate the disposal value or scrap value of the asset P_n at the end of n years.

Let us take a hypothetical example to explain how the marginal efficiency of capital is calculated. Let

us suppose that the supply price (cost) of a machine is Rs. 16,000 and it has a useful economic life of 2 years. The prospective yield on this machine in each year is Rs. 7,200 and its disposal value is also Rs. 7,200. Then the marginal efficiency of capital can be obtained with the help of equation (3) as follows:

$$\text{Rs. } 16{,}000 = \frac{7{,}200}{(1+r)} + \frac{7{,}200}{(1+r)^2} + \frac{7{,}200}{(1+r)^2}$$

or $16{,}000\ (1 + r)^2 = 7{,}200\ (1 + r) + 7{,}200 + 7{,}200$

or $16{,}000 + 32{,}000r + 16{,}000r^2 = 7{,}200 + 7{,}200r + 7{,}200 + 7{,}200$

or $16{,}000\ r^2 + 24{,}800r - 5{,}600 = 0$

which gives $r = 0.2$ or 20 per cent per annum.

With this rate of return, investment in the machine will be profitable if the cost of borrowing funds (*i.e.*, the rate of interest) is less than 20 per cent. For example, in the above illustration, given that the cost of capital asset is Rs.16,000 we found its MEC to be 20 per cent. If the rate of interest were 18 per cent, the investment would be profitable. However, if the rate of interest were 22 per cent the investment would be unprofitable. Moreover, simply by finding the difference between MEC and the rate of interest, we get the net rate of return expected on the capital asset after allowance of all costs. Thus with the MEC at 20 per cent and rate of interest at 18 per cent, purchase of the capital asset promises a net return of 2.0 per cent over and above all costs.

Since the MEC and the rate of interest are both percentages, they are sometimes confused. However, it is necessary to point out that the estimation of MEC does not depend on the rate of interest in any way. Once the MEC is determined in the manner explained above, it is then compared with the rate of interest to find out whether the purchase of the capital asset is worthwhile or not. If MEC > i (the rate of interest), the purchase is worthwhile. If i > MEC, it is not so.

THE MEC SCHEDULE AND THE RATE OF INVESTMENT

Shape of the MEC Curve

Let us now discuss the relationship between the marginal efficiency of capital and the planned investment. But before we do so, we must explain the shape of the marginal efficiency of capital curve. Normally, this curve slopes downward from left to right as depicted in Figure 10.2.

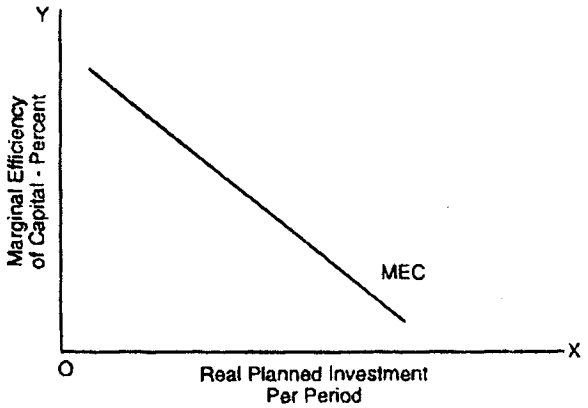

Fig 10.2. The marginal efficiency of capital curve slopes downward from left to right

In Figure 10.2, Y-axis denotes the marginal efficiency of capital and the X-axis denotes the amount of real planned investment. The negative slope of the MEC curve indicates that the marginal efficiency of every type of asset will diminish, as investment in it increases. The main reason for this is that the prospective yield of any type of asset will decline as more units of it are produced. Second, the supply price of the asset may increase since a large volume of investment will put "pressure on the facilities for producing that type of capital".

The larger the volume of investment within a given period of time, the lower will be the prospective annual returns, and the higher will be the replacement cost. Accordingly, the larger the volume of investment, the lower will be the rate of return over cost, *i.e.*, the marginal efficiency of capital[9].

Determination of Real Investment Equilibrium

Figure 10.3 shows the determination of the equilibrium amount of real investment. In this diagram, the MEC curve is the same as in Figure 10.2. We assume that the rate of interest is 8 per cent and is invariant with respect to the amount of investment. Therefore, the interest curve *PR* becomes parallel to *X*-axis. The equilibrium amount of investment is now determined where the MEC curve intersects *PR*, *i.e.*, the curve representing the rate of interest. In the diagram, equilibrium amount of real planned investment is *OI* per year. ***If the rate of interest is lower, the amount of real planned investment would be larger. Conversely, if the rate of interest is higher the amount of real planned investment would be smaller.***

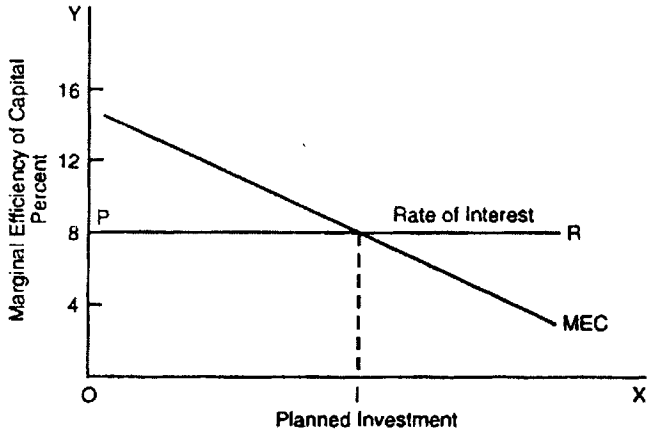

Fig. 10.3. Equilibrium amount of real planned investment is determined at the point where MEC = Rate of interest

Summarising the whole analysis it may be said that ***given the marginal efficiency schedule, and the rate of interest, the equilibrium amount of real planned investment per period can be determined with reference to the point of intersection of the two schedules.***

Characteristics of the MEC Schedule

As analysed earlier, the MEC schedule expresses a functional relationship between the marginal efficiency of capital and the amount of real planned investment. Obviously, the amount of real planned investment is the critical variable of the MEC schedule. But there are some other variables whose marginal response coefficients are such that in the short period they can be assumed to have an invariant value. These are called the parameters of the marginal efficiency of capital schedule. The five principal parameters are as follows:

(*i*) the community's stock of real capital
(*ii*) techniques as given by the production function
(*iii*) the supply conditions of capital assets
(*iv*) the business expectations
(*v*) the degree of uncertainty.

The size of the community's stock of real capital is important, because the smaller it is, higher is the marginal productivity of capital and thus the prospective returns on the new investment. As the community's stock of real capital increases, its marginal productivity and also with it the prospective returns on the new investment decline. It is, however, only in the long run that the magnitude of the real capital stock changes. In short run it may be assumed to be given. The state of techniques is another important parameter. In the Western countries where technological growth is very fast, continuous improvements in the production techniques have arrested any decline in the marginal productivity of capital and also in the rate of return on investments. But even there, in relatively short period, the technological changes are not such that they may cause a shift in the MEC curve. Any change in the supply conditions of the fixed capital can cause a shift in the marginal efficiency of capital schedule. Suppose, for some reasons, at all rates of investment, the cost of capital assets increases. This will reduce the prospective returns from the investment, and thus the MEC curve would shift leftward. However, this is not likely to happen in the short period.

The fourth and fifth parameters—business expectations and uncertainty are of crucial importance. In fact, Keynes discusses them in great detail in Chapters 11 and 12 of *General Theory*. We shall consider them separately in the section on 'Business Expectations and the MEC' below.

It would suffice to note here that the marginal efficiency of capital at any time depends significantly on the state of business expectations and the degree of uncertainty. Any change in the economic or political situation—national or international—can upset the calculations of investors and with it the marginal efficiency of capital schedule will shift. For example, let us suppose that in some State a party representing the working class interests captures political power. This would be taken by the business community as a warning that in future the exploitation of labour would not be that easy and with it the MEC schedule would shift to the left of the original one. Fear of recession, heavy commodity taxation and the withdrawal of protection are some other factors which generally depress the business expectations, and thus cause a downward revision in the prospective yields on new capital assets. The degree of uncertainly is closely related to the expectations. In this changing world, it is impossible for an entrepreneur to have firm estimates of the prospective returns on the new investments. But in some cases he can be more confident about his estimates. If an entrepreneur is somewhat uncertain about his expectations, he will be a little hesitant in making investment.

Business Expectations and the MEC

While discussing the theory of employment in Chapter 9, we had pointed out that the volume of employment is determined by the propensity to consume and the inducement to invest. Since the propensity to consume is relatively stable, fluctuations in the level of employment depend primarily on the inducement to invest. The inducement to invest, in turn, depends on the rate of interest and the marginal efficiency of capital. Since the rare of interest is relatively 'sticky', fluctuatations in the inducement to invest depend primarily upon changes in the marginal efficiency of capital. The two determinants of the marginal efficiency of capital are the supply price or cost and the prospective yield or return. In the short run, the production conditions are likely to be fairly stable and, therefore, the supply prices of assets are also likely to be fairly stable. Therefore, the prospective yield of assets is the crucial factor in the short run. The instability in employment and, in fact, a great part of the instability of economic life under capitalism is attributable to the unstable character of prospective yields from capital assets.[10]

An important point to be noted in this entire discussion is that the emphasis is on *prospective yields* in determining the voloume of investment and not on actual yields of assets. This is due to the reason that at the time an investment is made, the yields are nothing but *expectations* on the part of the investor. This brings to the fore the importance of business expectations in determining the marginal efficiency of capital. In fact, "a prospective yield is what an entrepreneur *expects* to obtain from selling the output of his capital assets."[11] It is due to this reason that Keynes emphasized the link between estimates of the prospective yield of assets and expectations about the future as these reveal themselves in stock exchange prices.

Capital Stock and the Rate of Investment : The Concept of MEI

As stated earlier, the equilibrium amount of real planned investment for a firm is determined at the point where MEC = i. If MEC > i, the firm would increase investment. Thus, there will be an addition to the capital stock of the firm. On the other hand if MEC < i the firm will undertake disinvestment and there will be a reduction in its capital stock. When MEC = i, a position of equilibrium will be achieved. In such a position, the firm has that stock of capital which is for it the profit-maximising or desired stock (thus actual stock becomes equal to the desired stock). There will be no net investment and the gross investment will be whatever is required for replacement purposes only.

If the MEC schedules of all firms are added horizontally, we would get an aggregate MEC curve which, as in the case of individual MEC curve, will slope downwards from left to right. The economy as a whole can be regarded in equilibrium at that aggregate stock of capital level at which MEC = i. In such a case, the profits would be maximized and there would be no net investment or disinvestment. Thus the actual aggregate stock of capital will be the desired or optimum stock of capital. Now, if something happens—for example, a reduction in interest rate or a technological innovation—to increase the optimum stock, there will be an increase in investment expenditures so that the actual capital stock increases to touch the level of the optimum (or desired) capital stock. However, expansion of the actual capital stock to the desired level is bound to take time and will also depend on the productive capacity of the capital goods industries. If the supply curve of the capital goods industries is perfectly elastic throughout, the net investment will increase at a relatively faster rate than when

the supply curve of capital goods industries is upward sloping and the optimum level of capital stock will be achieved earlier. However, in general, as the capital goods industries expand to meet the higher demand, marginal costs show a tendency to increase leading, in turn, to higher prices of capital goods. Thus the supply curve of capital goods is generally expected to be upward sloping. The rising prices of capital goods slow down the rate of investment spending and thus increase the time period required to increase the actual stock of capital to the level of optimum (or desired) stock of capital.

The above discussion shows that in determining the economy's level of investment, it is necessary to take into account the productive capacity of capital goods industries as well. Therefore, some economists like Gardner Ackley insist on distinguishing between the marginal efficiency of capital (MEC) and the marginal efficiency of investment (MEI). ***The concept of marginal efficiency of investment (MEI) differs from the marginal efficiency of capital (MEC) in that it shows the relationship between the rate of interest and the economy's level of investment when changes in the prices of capital goods are taken into account.***[12]

NOTES

1. J.M. Keynes, *The General Theory of Employment, Interest and Money,* (Harcourt, Brace and Co., Inc., 1936), p. 96. This, as said earlier, is also known as the 'psychological law of consumption'.
2. Gardner Ackley, *Macroeconomic Theory* (New York: The Macmillan Company, 1969), p. 226.
3. Rudiger Dornbusch and Stanley Fischer, *Macroeconomics* (McGraw-Hill International Book Company, 1985), p. 171.
4. Millton Friedman, A *Theory of the Consumption Function* (Oxford & IBH Publishing Co. Indian reprint, 1970), p. 220.
5. Thomas Dernberg, *Macroeconomics* (McGraw-Hill Book Company, 1985), p. 82.
6. Dornbusch and Fischer, *op. cit.,* p. 176.
7. F.S. Brooman, *Macroeconomics* (London; George Allen & Unwin Ltd., 1967), p. 42.
8. J.M. Keynes, *op, cit.,* p. 135
9. A.H. Hansen, *A Guide to Keynes* (McGraw-Hill Book Company, 1953), p. 119.
10. Dudley Dillard, *The Economics of John Maynard Keynes* (Londan: Gosby Lockwood & Son Ltd., 1950), p.142.
11. *Ibid.,* p.143. Emphasis added.
12. Thomas Dernberg, *Macroeconomics* (McGraw-Hill Book Company, 1985), p. 138.

CHAPTER

11 NATIONAL INCOME DETERMINATION

This chapter is devoted to a discussion of national income determination. The two approaches that are considered in this context are known as (1) the aggregate demand and the aggregate supply approach, and (2) the saving and investment approach.

This chapter begins with the discussion of national income determination in the case of a two sector model consisting of firms and households. Therefore, we assume that there is no government. We also assume that the economy is a closed one, *i.e.*, there is no foreign trade. Subsequently we shall introduce government and foreign trade in our discussion.

In this chapter while attempting to explain national income determination we address the following questions:

- How is the equilibrium level of income determined in a two sector model?
- Is it true that the two approaches — aggregate demand and aggregate supply approach and the saving and investment approach — yield the same result?
- How is equilibrium level of income determined in a three sector model, that is, when the economy is composed of households, business firms and the government?
- How can the process of national income determination in the case of an open economy be explained by (1) aggregate demand and aggregate supply approach, and (2) leakages and injection approach?

THE EQUILIBRIUM LEVEL OF INCOME—TWO-SECTOR MODEL

An economy's real income is said to be in equilibrium when the production plans of firms and the expenditure plans of households and firms are realized.

Let us first consider a two-sector economy, *i.e.*, we assume that the government does not intervene in the production process of the economy. All decisions concerning production are taken by individual firms. Whereas decisions concerning spending are made by individual households, investment expenditure is planned by individual entrepreneurs. The interaction of the planned production by firms with the planned consumption spending of households and the planned investment expenditure of entrepreneurs results in what is know as the equilibrium level of real income.

We all know that a supply and a demand aspect is involved in the determination of the price of a commodity. Similarly, in the determination of the real income in an economy both supply and demand play a key part. The supply aspect in this case is the combined planned production of individual firms which gives rise to the aggregate supply of all kinds of goods and services. Since production depends on such factors which are not likely to change in the short period, the aggregate supply can be assumed to be stable. The planned expenditure on consumer goods by households and the planned expenditure on capital equipment, and stocks of finished goods by firms give rise to the aggregate demand. The aggregate demand, particularly due to volatile nature of the investment expenditure, is relatively unstable and explains changes in the level of real income.

In modern macroeconomic analysis, economists following Keynes very often state the equilibrium condition in terms of aggregate demand and aggregate supply. Just as supply and demand are brought into equilibrium by the equilibrating mechanism of price, so are aggregate demand and aggregate supply equilibrated by the income mechanism. Thus any level of income, other than the one where aggregate demand and aggregate supply are equal, will be off the equilibrium.

At the equilibrium level of real income not only the aggregate demand and aggregate supply are equal but the planned saving is also equal to the planned investment.

This is due to the reason that in the simple economy that we are analyzing, saving is the only leakage from the income stream, and investment is the only injection into the stream. Thus, equilibrium will prevail if planned saving is equal to planned investment, or $S = I$. At the equilibrium level of real income, no one will have any incentive to revise his plans, and the economy will not show any sign of drifting away from the equilibrium position.

Since production and expenditure decisions are taken by different people, there is every possibility that aggregate supply is different from aggregate demand. Let us consider a situation in which producers are pessimistic about the demand. Obviously they will be cautious in this case and may underestimate the demand. Their planned production in this situation will naturally be inadequate to meet aggregate demand. Realising their mistake in judging the demand for their products, producers will try to meet planned expenditures by running down their stocks. There is no other alternative with the producers to meet excess demand. When the producers are faced with an excess demand situation, they are not able to build up their stocks at the desired rate, and hence *ex-post* (actual) investment would be less than *ex-ante* (planned) investment. Producers' inability to meet demand from current production would make their outlook optimistic and consequently they may plan bigger outputs for the future.

When producers overestimate demand and act accordingly, planned consumption expenditure of households and the investment expenditure of firms cannot exhaust their output. That is to say, aggregate supply will exceed aggregate demand and an involuntary accumulation of stocks would take place. This is likely to have a somewhat depressing effect on the outlook of producers who in their effort to optimise their profit would revise their production plans downwards until aggregate supply becomes equal to aggregate demand. Once this situation is obtained, unexpected accumulation of stocks would not take place.

Thus in the case of a departure from the equilibrium level of income either due to excess aggregate demand or excess aggregate supply, forces inherent in the system would operate in such a manner that this level is restored again.

EQUILIBRIUM LEVEL OF INCOME — EQUATIONS

We have stated earlier that at the equilibrium level of real income (*i*) aggregate demand and aggregate supply are equal, and (*ii*) planned saving and planned investment are equal. Thus a quantitative estimate of the equilibrium level of income can be obtained by using either of the above two relationships.

Form 1 : Aggregate Demand and Aggregate Supply are Equal

In this form we use the relationship

$$\text{Aggregate Demand} = \text{Value of output (income)}$$

or

$$Y = C + I$$

Let us write the consumption function as $C = a + bY$ and assume that $I = \bar{I}$ (*the bar indicates that investment is autonomous and given*). Then

$$Y = a + bY + \bar{I}$$

Therefore equilibrium income level is given by

$$Y = \frac{1}{1-b}(a + \bar{I}) \quad \ldots (1)$$

Form 2: Planned Saving and Planned Investment are Equal

In this form we use the relationship

$$S = I$$

Since

$$S = Y - C$$

$$= Y - (a + bY) = -a + (1-b)\,Y$$

and $I = \bar{I}$

the equilibrium condition becomes

$$-a + (1 - b)\,Y = \bar{I}$$

which yields

$$Y = \frac{1}{1 \square \square}(a + \bar{I})$$

same as (1) above.

Let us now consider a numerical example to illustrate how equilibrium level of national income is calculated. Suppose that in the economy under consideration, investment in a period is autonomous and thus fixed, say at Rs. 160 crore. The consumption function is of the form given above, *i.e.*, $C = a + bY$ where the spending on consumer goods is Rs. 40 crore plus 60 per cent of each increment of income (that is marginal propensity to consume is 0.6). The equilibrium level of income in this economy is then obtained as follows:

$Y =$ $a + bY + I$ (basic equation)

$Y =$ Rs. 40 crore + 0.6 Y + Rs. 160 crore

or $Y - 0.6Y =$ Rs. 200 crore

or $0.4Y =$ Rs. 200 crore

or $Y =$ Rs. 500 crore.

DETERMINATION OF NATIONAL INCOME : A GRAPHICAL PRESENTATION

Aggregate Demand and Aggregate Supply Approach

Let us now explain the determination of national income with the help of aggregate demand and aggregate supply schedules. We assume that the consumption function remains the same as in the case of the basic equation, that is, $C = a + bY$. Further, planned investment expenditure, I, is assumed to be autonomously determined and thus taken as fixed for all levels of income. Consider Figure 11.1.

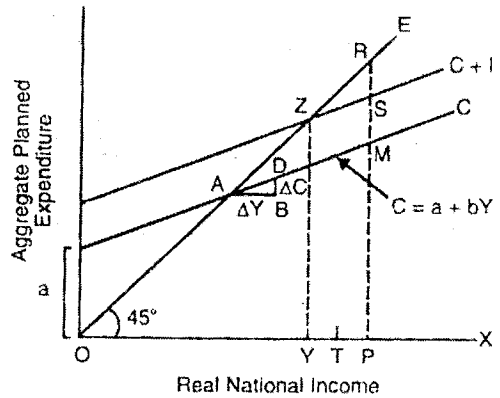

FIG. 11.1. Determination of national income with the help of aggregate demand and aggregate supply schedules

In Figure 11.1, the symbols C and I refer to *ex-ante* or planned values. X-axis denotes real national income; Y-axis denotes aggregate planned expenditure. E is 45° line which indicates that real national income

at all levels would be equal to consumption plus saving. C is the aggregate consumption function or the aggregate propensity to consume schedule. Since its form has been defined as $C = a + bY$, a, the intercept in the diagram indicates the minimum amount of consumption spending which households plan at zero level of real national income. As the income rises, the planned consumption spending also increases at a constant rate indicated by b, which is, as a matter of fact, marginal propensity to consume. In Figure 11.1 the MPC is measured, for example, by

$$\text{MPC} = \frac{\Delta C}{\Delta Y} = \frac{BD}{AB}$$

As in our example the MPC is constant at all levels of income, the slope of the C curve remains uniform throughout and thus the aggregate propensity to consume schedule acquires a linear form.

To obtain the aggregate demand schedule, the planned expenditure by the households, $C = a + bY$, and by firms, I, are to be added together. It can be seen in Figure 11.1 that the aggregate demand schedule (in Figure11.1, $C + I$) indicates the aggregate planned expenditure associated with each level of real income. The producing firms do not have any device whereby they could guess the aggregate demand correctly. Nonetheless, they must produce on the basis of their expectations, whatever be their reliability. Let us assume that the firms are optimistic about the demand, and thus decide to produce OP quantity. This production level gives rise to a matching flow of real income and corresponding to this will be a unique level of aggregate demand, PS, composed of planned spending by households, PM, and planned investment expenditure, MS. Whether this represents an equilibrium level of income depends upon whether the aggregate demand that is, the planned expenditure, equals the aggregate supply. A careful observation of Figure 11.1 reveals that at OP level of output, the aggregate demand is inadequate to exhaust it, and thus involuntary investment in stocks is bound to occur. In our diagram, the planned expenditure falls short of the aggregate supply by TP which is the same as RS. This will have a sobering effect on the producers who will reduce their output. This will continue to happen until the aggregate demand equals the aggregate supply at OY level of income. At all points towards the left of Y, aggregate demand is greater than aggregate supply and there will be depletion of stocks. This will induce producers to expand the level of output and the income and thus there will be a movement towards Y. The equilibrium will be reached ultimately only at the level of income OY where aggregate demand is equal to aggreagate supply. At this level of real income, the aggregate planned expenditure is YZ which is precisely the same as OY. Therefore, in this situation, there is neither any involuntary accumulation nor depletion of stocks which implies that no one will have any incentive to drift away from this position. Thus we reach the following conclusion:

The equilibrium level of national income is at the intersection of the C + I schedule of planned total expenditure with the 45° line depicting the value of total national output. Since C + I curve is the aggregate demand curve while the 45° line is known as the aggregate supply curve, the above statement means that equilibrium level of national income is obtained at the point where aggregate demand and aggregate supply curves intersect.

Saving and Investment Approach

Determination of national income can also be explained with the help of saving and investment schedules. This has been done in Figure 11.2 in which I and S denote the aggregate investment and aggregate saving schedules respectively. I curve is parallel to the X-axis which indicates that the planned investment remains constant regardless of the level of income. The saving, however, changes as the level of income rises or declines. As saving and consumption have Siamese twins relationship, from the consumption function of $C = a + bY$ form, we obtain saving function as $S = -a + (1 - b)\ Y$. Thus, the aggregate saving schedule, S, has a positive slope which indicates that as the real income rises, the saving also increases at a stable rate. A cursory glance at Figure 11.2 makes it clear that ***at OY_0 level of real income, the planned saving is precisely the same as the planned investment. Therefore, OY_0 is the equilibrium level of income.*** At all other levels of income, the producers would not be satisfied with their existing positions and thus would either contract or expand output as the case may be. Let us consider OY_1 level of real income. In this situation, the planned saving is S_1Y_1 whereas the planned investment is I_1Y_1. Since planned (or intended) saving falls short of business firms' planned (or intended) investment, the result is that there is consumption of more goods than are being currently produced. Thus the firms willl be able to dispose off their accumulated stocks quickly. They will also be tempted to expand production and hire more men. Thus the level of national income and output will rise. This process will continue until the point S_0 is reached where $I = S$. On the other hand, when the income level is

OY_2, the planned saving is more than planned investment ($S > I$). Thus households are saving more than firms are willing to go on investing. Thus firms will observe that their inventories start piling up. In a bid to cut down on this involuntary accumulation of stocks, the firms will plan a cut-back in production and lay off workers. As a result, the level of national income and national output will decline. This process will continue till once again the point S_0 is reached. Therefore, equilibrium is reached at point S_0 where planned saving is equal to planned investment and the level of income corresponding to this point, OY_0 is the equilibrium level of income. Thus we reach the following conclusion:

The equilibrium level of national income is determined by the point of intersection of the saving and investment schedules. At any other point, the planned saving of household will not match the planned investment of firms, and this discrepancy will cause the firms to change their production and employment levels in such a way so as to return the system to the point of intersection.

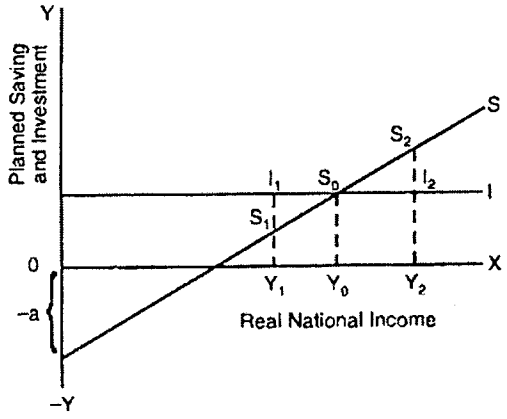

FIG. 11.2. Determination of national income with the help of saving and investment schedules

The saving-investment approach makes it clear that planned saving is equal to planned investment at the point of equilibrium.

Thus we are now in a position to fully understand and reconcile the saving-investment equality.

While ex-post or realised saving and investment are always equal, ex-ante or planned saving and investment are equal only in equilibrium. The saving-investment approach of determining national income has the further merit of focussing attention on the fact that disparity between planned saving and planned investment results in unplanned investment or disinvestment in stocks which are symptoms of disequilibrium in the economy. At the equilibrium level of income, the actual investment equals both planned investment and planned saving and thus any unplanned investment or disinvestment is completely ruled out.

The Two Approaches Yield the Same Result

We have discussed diagrammatically the two approaches of finding out the equilibrium level of national income–the aggregate demand-aggregate supply approach and the saving-investment approach. Both of them yield the same equilibrium income as can be verified by lining up Figure11.1 vertically upon the same axis as Figure 11.2 as can be seen from Figure 11.3.

In this Figure11.3, information on real income is taken on the X-axis while information on planned saving, planned investment, planned consumption and aggregate demand is taken on the Y-axis. The aggregate demand curve ($C + I$) and the aggreagate supply curve ($Y = C + S$) cut each other at point E which, therefore, is the point of equilibrium income. As can be read off the figure, the equilibrium level of national income is Rs. 500 crore. Now planned saving curve S is drawn on the basis of information $Y - C$. The level of investment is constant at all levels of income. Thus the planned investment curve is the horizontal line I parallel to the X-axis. The S and I curves intersect at point F. As can be seen from Figure 11.3, point F lies vertically below point E, and therefore, yields the same level of equilibrium income Rs. 500 crore as obtained earlier. Thus both the approaches yield the same result.

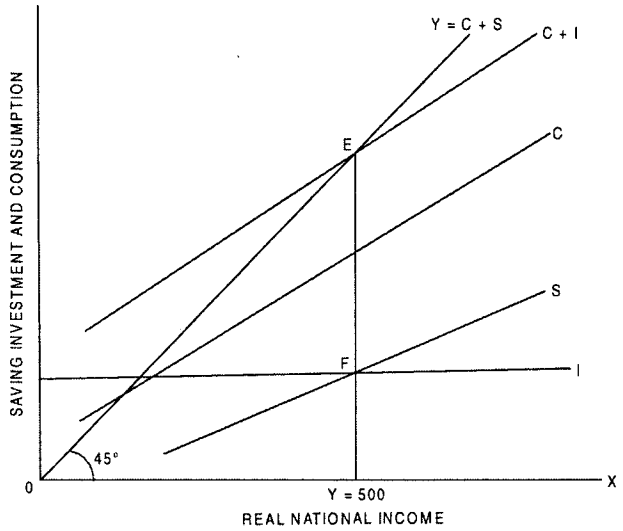

FIG 11.3 : Aggregate demand-aggregate supply approach and the saving-investment approach yield the same result

EQUILIBRIUM LEVEL OF INCOME–THREE-SECTOR MODEL

In the preceding section we have explained the determination of income in the two-sector model of an economy composed of consumers and business firms. In this section we shall consider a third sector also, that is, the government, and examine the effects of government expenditures (G) and taxation (T) on the level of income. In the three-sector model, agregate spending is composed of personal consumption (C), private investment (I) and government expenditures (G) and an aggregate flow of income is allocated to consumption (C), private saving $(S)_r$ and taxes (T). The government can influence aggregate spending in any time period by its expenditure and taxation policies, and thereby raise or lower the level of income. The actual effect of the government policy on income level will depend on how much it spends and on how much revenue it raises through tax collections. ***In case its net tax proceeds are less than its expenditures, there will be a net injection into the spending stream and, as a result, the level of income will rise. If, on the contrary, government expenditures are less than net tax collections, the level of income will fall.***

The Equilibrium Condition

We shall now attempt to explain the determination of the equilibrium level of income in the three-sector model of an economy. In this case, the total planned spending is $C + I + G$ and it must be just sufficient to clear the market of the current level of output (Y), *i.e.*, for equilibrium, we must have $Y = C + I + G$ where G indicates government expenditure.

In the present case, $C = a + bY_d$ where $Y_d = Y - T$ (here Y_d indicates disposable income and T is the amount of taxes imposed by government). This is due to the reason that the consumption of households will depend on the income that is left at their 'disposal' after the payment of taxes.

As was the case with our two-sector model, ***for aggregate demand to be just equal to the value of output, any leakage from income flow must be precisely offset by an equal injection into the income stream.*** In the present three-sector model, there are two sources of leakage, saving (S) and tax collection (T) and two sources of injection, investment (I) and government expenditure (G). Therefore, for equilibrium, we must have

$$S + T = I + G.$$

The equilibrium condition in the case of a three-sector model can be represented in either of the two forms:

$$(i) \qquad Y = C + I + G$$

or $$(ii) \qquad S + T = I + G$$

A quantitative estimate of the equilibrium level of income can thus be obtained by using either of the above two relationships.

Form 1: Aggregate Demand and Aggregate Supply are Equal

In this form we use the relationship

$$Y = C + I + G$$

The consumption function is $C = a + bY_d$. Let us suppose that I is autonomous and given so that it is a constant $\bar{I}$. G and T are exogenously determined (they are government policy decisions) and are also assumed to be given and constant, $\bar{G}$ and $\bar{T}$ respectively. Then

$$\begin{aligned} Y &= C + I + G \\ &= a + bY_d + \bar{I} + \bar{G} \\ &= a + b(Y - \bar{T}) + \bar{I} + \bar{G} \end{aligned}$$

the equilibrium condition becomes

$$(1 - b)Y = a + \bar{I} + \bar{G} - b\bar{T}$$

which yields

$$Y = \frac{1}{1-b}(a + \bar{I} + \bar{G} - b\bar{T}) \qquad ...(2)$$

Form 2: Leakages are Equal to Injections

It is modified version of $S = I$ in the three sector model. In this form we use the relationship

$$S + T = I + G$$

Since $S = Y_d - C$, the above equation can be written as

$$(Y_d - C) + \bar{T} = \bar{I} + \bar{G}$$

Now, $Y_d = Y - \bar{T}$ and $C = a + b(Y - \bar{T})$. Therefore

$$Y_d - C = Y - \bar{T} - a - bY + b\bar{T} = Y - a - bY + b\bar{T} - \bar{T}$$

Substituting in the above relationship, we get

$$Y - a - bY + b\bar{T} - \bar{T} + \bar{T} = \bar{I} + \bar{G}$$

or

$$(1 - b)Y = a + \bar{I} + \bar{G} - b\bar{T}$$

which yields

$$Y = \frac{1}{1-b}(a + \bar{I} + \bar{G} - b\bar{T})$$

same as (2) above.

Numerical Example

Let us now consider a numerical example to illustrate how equilibrium level of national income is calculated. Let us suppose that the amount of personal consumption is Rs. 40 crore plus 60 per cent of each increment of disposable personal income which means that marginal propensity to consume is 0.6. Further, assume that the entire investment made in the period is autonomous and fixed at Rs. 160 crore, while the tax collection and the government expenditure are Rs. 100 crore and Rs. 120 crore respectively. For finding out the equilibruim level of income in this economy we will substitute these values in the basic equation and solve it.

$$Y = C + I + G \qquad \text{(basic equation)}$$

or

$$\begin{aligned} Y &= a + b(Y - T) + I + G \\ &= 40 + 0.6(Y - 100) + 160 + 120 \text{ (substituting data)}^1 \end{aligned}$$

or

$$Y - 0.6Y = 260$$

or

$$Y = \text{Rs. } 650 \text{ crore.}$$

The equilibrium level of income in this economy is thus Rs. 650 crore. The economy will not move away from this level of income as long as spending plans of households, production plans of the firms, and the taxation and expenditure plans of the government do not change.

It can be verified easily that in the above example, the planned saving plus taxes are equal to planned investment plus government expenditure. For example, consumption is given by $C = a + b(Y - T) = 40 + 0.6(650 + 100) =$ Rs. 370 crore. Therefore $S + T = Y - C =$ Rs. 650 crore – Rs. 370 crore = Rs. 280 crore. Also $I + G =$ Rs. 160 crore + Rs. 120 crore = Rs. 280 crore, Thus, $S + T = I + G$.

Making Tax Revenue Endogenous

In the three-sector model considered so far, we have assumed that taxation is determined by exogenous factors and was thus taken to be a constant amount at all levels of income. However, we generally expect tax revenues to increase with the level of income. Therefore, to introduce realism into the model, it is necessary to take taxation as an increasing function of income. The simplest form would be a linear dependence of the type $T = \bar{T} + tY$ where T is total tax revenue, $\bar{T}$ is the autonomous component of taxes, t is the marginal tax rate (giving the response of tax collections to a change in income), and Y is total received income. The equilibrium condition is given by

$$Y = C + I + G$$
$$= a + bY_d + \bar{I} + \bar{G}$$

Since $Y_d = Y - T$ and $T = \bar{T} + tY$, we have

$$Y_d = Y - (\bar{T} + tY) = (1 - t)\, Y - \bar{T}$$

Then $Y = a + b\{(1 - t)\, Y - \bar{T}\} + \bar{I} + \bar{G}$

or $$Y - b(1 - t)\, Y = a - b\bar{T} + \bar{I} + \bar{G}$$

or $$[1 - b(1 - t)]\, Y = a + \bar{I} + \bar{G} - b\bar{T}$$

which yields $$Y = \frac{1}{1-b(1-t)}\left(a + \bar{I} + \bar{G} - b\bar{T}\right) \quad ...(3)$$

Modification in the Model to Introduce Government Transfer Payments

In the three sector model discussed above we have taken taxation into account but not the government transfer payments. However, gevernments in all countries transfer money to the people in the form of pension, socail security payments, welfare payments, unemployment compensation etc. Let us indicate such transfer payments by R and assume that they are autonomous. The modified three-sector model can then be written as

$$Y = C + I + G$$
$$C = a + bY_d = a + b\,(Y - T + R)$$
$$I = \bar{I}$$
$$G = \bar{G}$$
$$T = \bar{T}$$
$$R = \bar{R}$$

The substitution of the values in the basic equation gives

$$Y = a + b\,(Y - \bar{T} + \bar{R}) + \bar{I} + \bar{G}$$

or $$(1 - b)\, Y = a + \bar{I} + \bar{G} - b\bar{T} + b\bar{R}$$

which yields $$Y = \frac{1}{1-b}\left[a + \bar{I} + \bar{G} - b\bar{T} + b\bar{R}\right] \quad ...(4)$$

Determination of National Income — A Graphical Presentation

Determination of equilibrium national income for a three-sector economy is shown in Figure 11.4. On the X-axis is depicted the real national income and on the Y-axis, the aggregate plannned expenditure. The consumption funciton curve is C which is drawn on the basis of the equation $C = a + bY_d = a + b(Y - \bar{T})$ where $\bar{T}$ is the amount of taxation determined exogeneously (transfer payments are not considered). Since both investment and governement expenditures are assumed to be given and constant, they are the same at the levels of income. Accordingly, the $C + I + G$ curve lies above the consumption function by a constant amount.

Because of the autonomous nature of I and G, the $I + G$ line in Figure 11.4 (b) has been drawn as a horizontal line parallel to X-axis. This reflects the fact that the level of I and G does not depend on Y. The upward-sloping line $S + T$ in the figure plots the value of saving plus taxes. It slopes upward due to the fact that as income increases, savings also increase (*i.e.*, saving varies directly with income.) Since slope of the consumption function line in Figure 11.4 (a) is, b, the slope of the $S + T$ line in Figure 11.4 (b) is $(1–b)$.

Consider Figure 11.4 (a). In this figure aggregate demand curve, $C + I + G$ cuts the 45° line representing

the aggregate supply at point E which is therefore the point of equilibrium. This intersection illustrates the equilibrium condition $Y = C + I + G$. At the equilibrium level of income $S + T$ curve intersects the $I + G$ horizontal line as shown in part (b) of the figure.

To understand why the level of equilibrium income is $\bar{Y}$ consider points to the left and right of this level of income. First consider the level of income Y'. As is clear firm part (a) of the figure, at this level of income, aggregate demand exceeds income (the excess of aggregate demand over income being FA). Correspondingly, at this level of income, $I + G$ is greater than $S + T$ as can be seen from part (b) of the figure. Since demand oustrips production, desired investment will exceed actual investment with the result that production and hence income will increase. Thus there will be a movement towards $\bar{Y}$ and equilibrium will occur when the level of income $\bar{Y}$ is reached. Opposite happens at levels of income towards the right of $\bar{Y}$. For example, consider the level of income Y''. At this level of income, output exceeds aggregate demand by HB. Correspondingly, at this level of income, $S + T$ is greater than $I + G$ as can be seen from part (b) of the figure. Since production is greater than demand, there will be unsold stocks. This will force a cut in investment levels and hence production will fall. Thus there will be a movement towards $\bar{Y}$ and equilibrium will be restored when the level of inocme $\bar{Y}$ is reached.

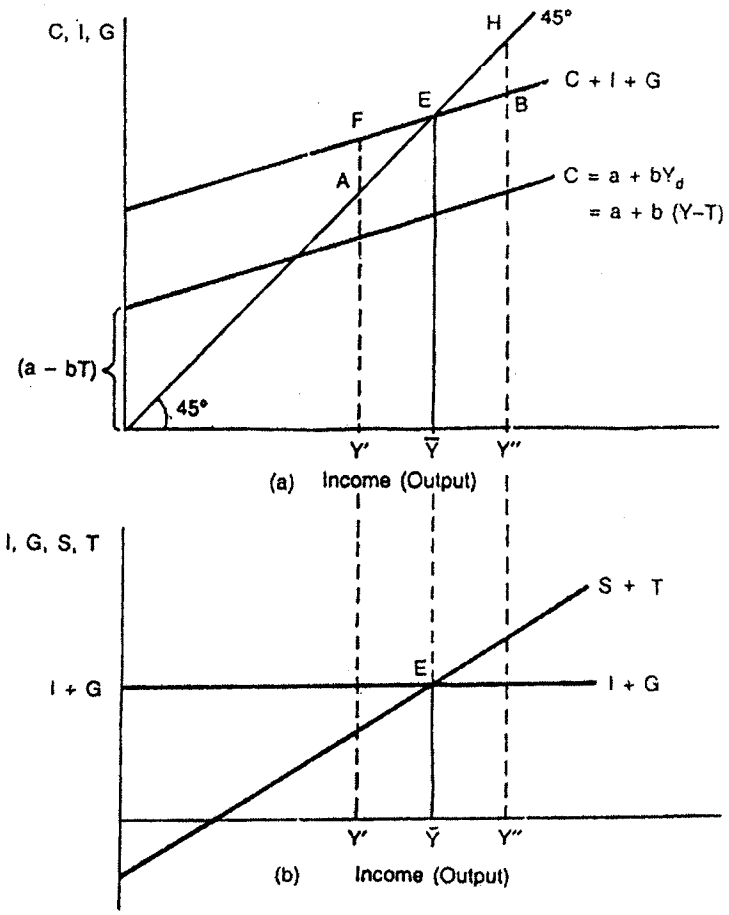

FIG. 11.4. Determination of equilibrium income: three sector economy

THE EQUILIBRIUM LEVEL OF INCOME — FOUR-SECTOR MODEL

In this final extension of the model, we include a fourth sector — ***the foreign trade sector*** — also. In order to understand the equilibrium level of income in four sector model, we shall consider India's case by way of example. We know that some part of the goods produced in India are demanded by consumers in other countries also. Thus one more component — export sales — has to be added to aggregate demand. Therefore, domestic output is absorbed by consumption, investment, government and exports. Similarly, some part of

Indian consumption, investment and government purchases must have been produced abroad (and hence imported into the country.) This part does not contribute directly to demand for domestically produced output. Therefore, all spending on imports must be deducted from the total final expenditures on consumption, investment and government purchases in arriving at a measure of aggregate demand for domestic production. Total demand for Indian output is then

$$(C + I + G - M) + X$$

where C, I and G are as defined earlier, X stands for exports and M for imports. The above expression is usually written as

$$C + I + G + (X - M)$$

where the role of foreign trade in determining aggregate demand is brought out by the term $(X - M)$ indicating net exports or net foreign expenditures.

The Equilibrium Condition

Since in equilibrium, planned spending is equal to output, we have

$$Y = C + I + G + (X - M)$$

In the alternative form, leakages are equal to injections. The leakages are saving (S taxation (T) and imports (M) while the injections are investment (I), government expenditures (G) and exports (X). Thus the condition for equilibrium is given by

$$S + T + M = I + G + X$$

The above discussion shows :

The equilibrium condition in the case of a four-sector model can be represented in either of the two forms : (i) $Y = C + I + G + (X- M)$, or (ii) $S + T + M = I + G + X$.

Form 1: Aggregate Demand and Aggregate Supply are Equal

Since we can assume that the Indian output has negligible effect on the income in the rest of the world, exports can be taken as exogenous and hence given. However, we generally assume that imports are a positive function of aggregate income. Thus they rise with national income. In the simplest version, we can take imports to depend on income in a linear way. Then

$$M = \bar{M} + mY$$

where $\bar{M}$ is the autonomous level of imports and m is defined as the marginal propensity to import. If I, $\bar{G}$ and $\bar{T}$ are all given (autonomous), the basic equation would give

$$Y = a + b\,(Y - \bar{T}\,) + \bar{I} + \bar{G} + \bar{X} - (\bar{M} + mY)$$

or $$Y = a + bY - b\bar{T} + \bar{I} + \bar{G} + \bar{X} - \bar{M} - mY$$

or $$(1 - b + m)\,Y = a - b\bar{T} + \bar{I} + \bar{G} + \bar{X} - \bar{M}$$

which yields $$Y = \frac{1}{1-b+m}\left[a + \bar{I} + \bar{G} + \bar{X} - b\bar{T} - \bar{M}\right] \quad ...(5)$$

Form 2 : Leakages are Equal to Injections

In this form we use the relationship

$$S + T + M = I + G + X$$

Since $S = Y_d - C$, the above equation can be written as

$$(Y_d - C) + \bar{T} + M = \bar{I} + \bar{G} + \bar{X}$$

Since $M = \bar{M} + mY$, the above yields

$$(Y_d - C) + \bar{T} + \bar{M} + mY = \bar{I} + \bar{G} + \bar{X}$$

Now $Y_d = Y - \bar{T}$ + and $C = a + b\,(Y - \bar{T}\,)$

Therefore, $(Y - \bar{T}\,) - a - b\,(Y - \bar{T}\,) + \bar{T} + \bar{M} + mY = \bar{I} + \bar{G} + \bar{X}$

or $$(1-b).(Y-\bar{T}) - a + \bar{T} + \bar{M} + mY = \bar{I} + \bar{G} + \bar{X}$$

or $$(1-b).Y - (1-b)\bar{T} - a + \bar{T} + \bar{M} + mY = \bar{I} + \bar{G} + \bar{X}$$

or $(1-b+m)Y-\bar{T}+b\bar{T}-a+\bar{T}+\bar{M}+mY=\bar{I}+\bar{G}+\bar{X}$

or $(1-b+m).Y=a+\bar{I}+\bar{G}+\bar{X}-b\bar{T}-\bar{M}$

which yields $Y = \frac{1}{1-b+m}\left[a+\bar{I}+\bar{G}+\bar{X}-b\bar{T}-\bar{M}\right]$

same as (5) above.

Modification in the Model to Introduce Government Transfer Payments

While deriving equation (5) we have not considered government transfer payments. If, however, we wish to include government trnafer payments, some modification will be necessary. If tranfer payments are R, then $C = a + b\,Y_d = a + b\,(Y - T + R)$. Generally tansfer payments are also taken to be autonomous, say $\bar{R}$. Then

$$Y = C + I + G + (X - M)$$
$$C = a + b\,(Y - T + R)$$
$$I = \bar{I}$$
$$G = \bar{G}$$
$$T = \bar{T}$$
$$R = \bar{R}$$
$$X = \bar{X}$$
$$M = \bar{M} + mY$$

The substitution of the values in the basic equation gives

$$Y = a + b\left(Y - \bar{T} + \bar{R}\right) + \bar{I} + \bar{G} + \bar{X} - \bar{M} - mY$$

which yields, on solution,

$$Y = \frac{1}{1-b+m}\left[a+\bar{I}+\bar{G}+\bar{X}+b\bar{R}-b\bar{T}-\bar{M}\right] \quad ...(6)$$

Graphical Depiction of Trade Balance

Before presenting graphical depiction of national income determination for a four sector model, let us depict export and import functions to show the balance of trade in an open economy. Since we have assumed in our discussion that export is autonomous (*i.e.*, $X = \bar{X}$, a constant) and import is a linear function of income $M = \bar{M} + mY$ where m is the marginal propensity to import, the functions can be depicted as in Figure 11.5.

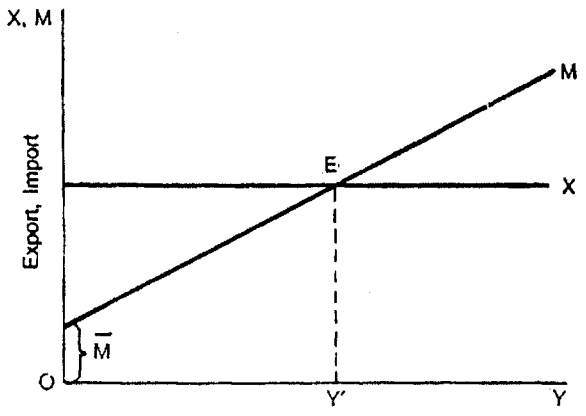

Fig. 11.5. Export and Import Functions

At zero level of income, imports are equal to $\bar{M}$ and, as income increases, imports increase. The exports are represented by the line parallel to the X-axis. Prior to the income level Y', exports exceeds imports ($X > M$). Therefore, there is favourable balance of trade, *i.e.*, the economy has a net export balance. After the income level Y', imports exceed exports ($M > X$). Therfore, there is an unfavourable balance of trade, *i.e.*, the economy has a net

import balance (or negative export balance). As is clear from the figure, "any change in the determinants of gross exports that shifts the export function upward will increase the net export balance or decrease the net import balance at each level of income. Similarly, any change that shifts the import function downward (decreases $\overline{M}$) or reduces the slope of the import function (decreases m) will have the same effect."[2]

Determination of National Income — A Graphical Depiction

Graphical depiction of national income determination model as we had done in the case of the two-sector and three sector models gets quite cumbersome in the case of the four-sector model. To reduce the complexity of the diagram, we have not drawn the consumption function separately in Figure 11.6.

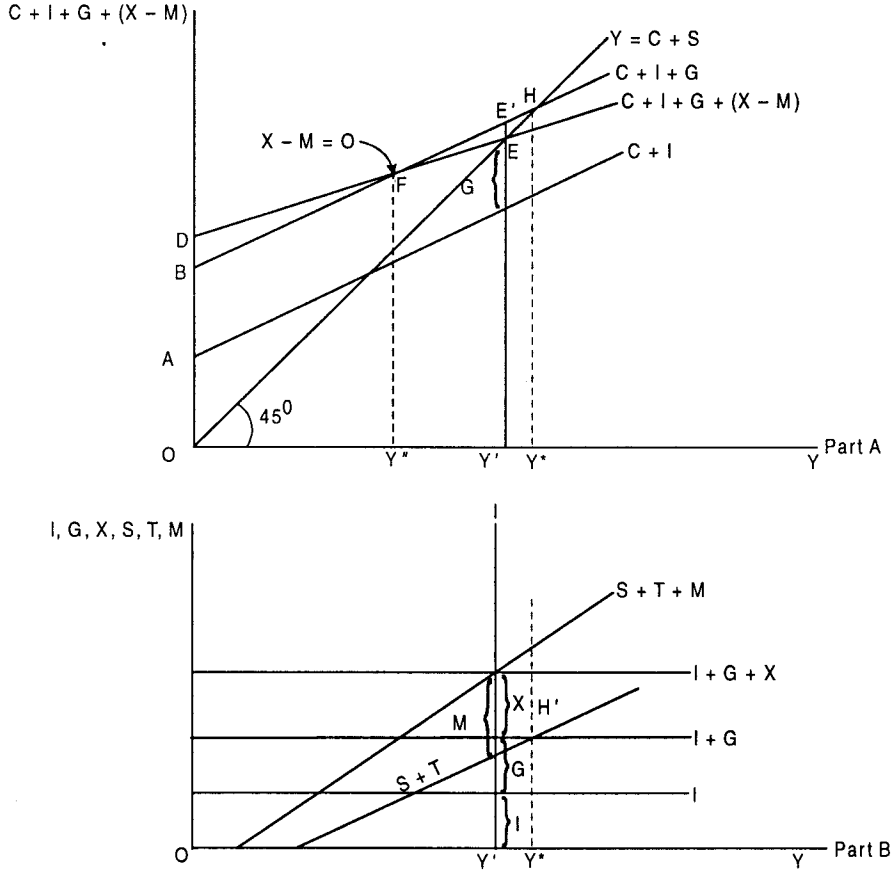

FIG. 11.6. Determination of Equilibrium Level of Income — Four Sector Model

In Figure 11.6, after drawing the 45° line $Y = C + S$ depicting that real national income is equal to consumption plus saving, we draw the line $C + I$. On this line is superimposed the autonomous goevenment expenditure G. This gives the $C + I + G$ line. Finally on the $C + I + G$ function is superimposed the last component of aggregate spending, net exports or $X - M$. This gives the complete aggregate demand function $C + I + G + (X - M)$ which cuts the 45° line at point E. Therefore, the equilibrium level of income is Y'. As far as $C + I + G$ and $C + I + G$ $(X - M)$ curves are concerned, they intersect at point F. Prior to this point, $C + I + G + (X - M)$ curve is above the $C + I + G$ curve which indicates that exports exceeds imports. As can be seen from the figure, at zero level of income $X - M = BD$, *i.e.*, exports exceed imports by BD. As income increases, this gap narrows down and at Y'' level of income $X - M = 0$ (or $X = M$). Therefore at this level of income exports and imports are equal to one another. Above Y'' level of income, imports exceed exports, and this excess grows larger at successively higher levels of income. $C + I + G$ curve is above the $C + I + G + (X - M)$ curve above income levels Y'' and the gap increases as income increases.

In the model discussed here, the introduction of foreign trade has reduced the equilibrium level of income than what would have been obtained in its absence. For instance, in the absence of foreign trade, the expenditure curve $C + I + G$ would have cut the 45° line at point H indicating a level of income Y^*— higher than Y'.

Part B of Figure 11.6 depicts the alternative approach to the determination of equilibrium level of income. As stated earlier, equilibrium level of national income is obtained when $S + T + M = I + G + X$. This happens at Y' level of national income. We had noted in the context of the two-sector economy, if $I > S$, there would be disequilibrium and the level of income would rise. Similarly, in the three-sector economy, if $I + G > S + T$, there would be disequilibrium and the level of income would rise. However, in the four-sector economy which has been depicted in Figure 11.6, the income expansionary effect of $I + G > S + T$ is offset by the income contractionary effect of $M > X$. Accordingly , instead of Y^* level of income that would have been obtained in the case of a three sector economy (as, in the case $S + T = I + G$ at H' because $S + T$ curve cuts $I + G$ curve at H' corresponding to Y^* level of income), the equilibrium level of income obtained is Y'.

Numerical Example

The following information pertaining to an economy is given :

(*i*) Consumption is Rs. 40 crore plus 60 per cent of each increment of diposable personal income.

(*ii*) The entire investment is fixed and autonomous at Rs. 160 crore.

(*iii*) The tax collection and government expenditure are also fixed and given as Rs. 100 crore and Rs. 120 crore respectively.

(*iv*) Exports and imports are fixed and given as Rs. 50 crore and Rs. 30 crore respectively.

Find the equilibrium level of national income.

SOLUTION : From (*i*) above, the consumption function can be written as

$$C = 40 + 0.6Y_d$$
$$= 40 + 0.6\,(Y - T) = 40 + 0.6\,(Y - 100)$$

Then
$$Y = a + b(Y - T) + I + G + (X - M) \text{ (basic equation)}$$
$$= 40 + 0.6\,(Y - 100) + 160 + 120 + (50 - 30) = 280 + 0.6Y$$

or
$$Y - 0.6Y = 280$$

which yields
$$Y = 700$$

i.e., equilibrium level of national income is Rs. 700 crore.

A simple arithmetic calculation will show that in the above case $S + T + M = Rs.$ 330 crore which is also the value of $I + G + X$.

NOTES

1. Words 'Rs' and 'crore' have been dropped for clarity.
2. Edward Shapiro, *Macroeconomic Analysis,* (Fifth edition, 1989), p. 116.

CHAPTER

12

THE THEORY OF MULTIPLIER

The Concept of Multiplier
Two-Sector Model
• *The Static Multiplier* • *The Dynamic Multiplier*
Three Sector Model
• Government Expenditure Multiplier • The Tax Multiplier • Balanced Budget Multiplier
Four-Sector Model
• The Foreign Trade Multiplier • The Balance of Payments Effect of a Change in Investment • Exports as a Function of Imports—Foreign Repercussions

The theory of multiplier explains how an economy moves from one level of income to another level of income as a result of shifts in the aggregate demand schedule. It has important policy implications and is an indispensable tool to explain the consequences of changes in spending plans on the level of economic activity.

In this chapter, while explaining the theory of multiplier, we address the following questions :

- What is the concept of multiplier in modern macroeconomic theory ? How does dynamic multiplier differ from static multiplier ?
- Why will a given change in autonomous investment, in general, be associated with a change in income larger than itself ?
- What is the concept of government expenditure multiplier ? How does an increase in government expenditure have the same effect on income as an increase in investment ?
- What is balanced budget multiplier ?
- What is the concept of foreign trade multiplier ?

THE CONCEPT OF MULTIPLIER

Multiplier (k) is the ratio of the final change in equilibrium national income (ΔY) to the initial change in total planned expenditure (APE) that stimulated it.

Thus
$$k = \frac{\text{Final change in } Y}{\text{Initial change in } APE} = \frac{\Delta Y}{\Delta APE}$$

The above is a general definition of the multiplier. The change in total planned expenditure stated above could be a change in investment, change in government spending, or in the demand for exports, or in any other element of aggregate demand. The only requirement is that the change should be autonomous, *i.e.*, it should not be induced by a change in income itself.

TWO SECTOR MODEL

We shall first consider change in investment as it is in relation to this change that the concept of multiplier is

usually discussed. This multiplier is known at the 'investment multipiler' and, in terms of the general definition given above, is given as under.

Investment multiplier (k) is the ratio of the final change in equilibrium national income to the initial change in investment that stimulated it.

Thus $$k = \frac{\text{Final change in } Y}{\text{Initial change in } I} = \frac{\Delta Y}{\Delta I}$$

The Static Multiplier

We know that the value of national output equals aggregate spending. Thus we have

$$Y = C + I$$

Let us now suppose that investment increases by ΔI. Thus $\Delta Y = \Delta C + \Delta I$

Dividing both sides by ΔY, we get

$$1 = \frac{\Delta C}{\Delta Y} + \frac{\Delta I}{\Delta Y}$$

or $$\frac{\Delta I}{\Delta Y} = 1 - \frac{\Delta C}{\Delta Y}$$

Since $\frac{\Delta C}{\Delta Y}$ is the marginal propensity to consume and $\frac{\Delta I}{\Delta Y}$ is the reverse of the multiplier , we have

$$\frac{1}{k} = 1 - \text{MPC}$$

which yields the following result

$$k = \frac{1}{1 - \text{MPC}} \qquad ...(1)$$

This relationship can also be derived with the help of the equilibrium level of national income calculated in Chapter 11. In the two-sector model with consumption function $C = a + bY$ and autonomous investment I, the equlibrium level of income was obtained as

$$Y = \frac{1}{1-b}(a + \bar{I})$$ See equation (1) in Chapter11.

If the initial investment level is $\bar{I}_1$, this yields

$$Y_1 = \frac{1}{1-b}(a + \bar{I}_1)$$

If autonomous investment now rises to $\bar{I}_2$, the new equilibrium level of income is obtained as

$$Y_2 = \frac{1}{1-b}(a + \bar{I}_2)$$

On subtraction we get

$$Y_2 - Y_1 = \frac{1}{1-b}(\bar{I}_2 - \bar{I}_1)$$

or $$\Delta Y = \frac{1}{1-b}\Delta I$$

or $$\frac{\Delta Y}{\Delta I} = k = \frac{1}{1-b} = \frac{1}{1 - \text{MPC}}$$ same as (1) above

Greater the value of the MPC, greater is the value of the multiplier and less the value of MPC, less is the value of the multiplier. The two extreme cases are when MPC = 0 and when MPC = 1. From equation (1), it can be seen that when MPC = 0, k =1 and when MPC = 1, k is infinity. Thus the value of the multiplier lies between 1 and infinity.

We also know that MPC + MPS = 1, *i.e.*, MPS = 1 – MPC. Therefore from (1), we get

$$k = \frac{1}{\text{MPS}} = \frac{1}{s} \qquad ...(2)$$

i.e., ***multiplier is the reciprocal of the marginal propensity to save .***

The Diagrammatic Presentation. The diagrammatic presentation of the static multiplier is given in Figure 12.1. On the *X*-axis we have aggregate real income while on the *Y*-axis we have aggregate planned expenditure, consumption and investment. The initial point of equilibrium is *E* because at this point, aggregate demand and aggregate supply curves intersect each other. The equilibrium level of national income correspoding to this point is OY_1. Let us now suppose that an autonomous investment ΔI takes place pushing up the aggregate demand curve to $C + I + \Delta I$. This new curve intersects the aggregate supply curve $Y = C + S$ at point *F* which , therefore, is a new point of equilibrium. The equilibrium level of national income is now OY_2. Thus, as a result of an increase in investment by ΔI (= *FM*), the level of income rises by Y_1Y_2 or *ER* (= *FR*). As can be seen from the figure, the increase in income *FR* is greater than the increase in investment *FM* that stimulated it.

Thus $$k = \frac{\Delta Y}{\Delta I} = \frac{FR}{FM} > 1$$

which shows that, a given autonomous change in investment will be associated with a change in income larger than itself. How much larger depends on the slope of the consumption curve which is the same thing as marginal propensity to consume.

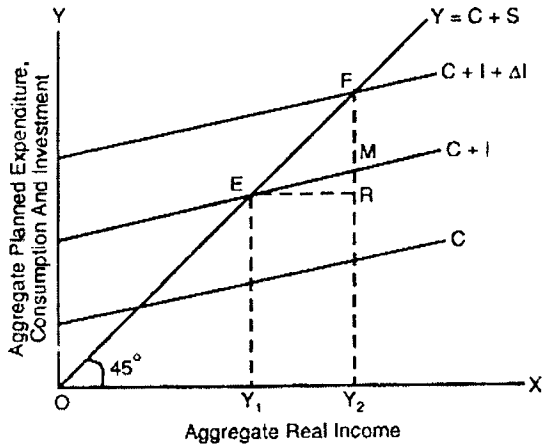

FIG. 12.1. Depiction of the mutiplier effect of an increase in autonomous investment — the case of static multiplier.

The Dynamic Multiplier

The multiplier described above is a static multiplier as it does not throw any light on how the new equilibrium position is reached. The process by which output adjusts itself to a new level of demand is assumed to take place instantaneously, *i.e.*, the time factor is ignored. In real life, the multiplier works through different periods of time. Therefore, one must focus attention on the sequence of events by which the economy moves from one position of equilibrium to another through time. This is accomplished in the case of a dynamic multiplier where the focus is on time, and therefore, on the process of change. To consider how a dynamic multiplier operates, let us work out a simple hypothetical example.

Let us suppose that the consumption function of an economy is $C = 20 + 0.5Y$ and the original investment level is Rs. 20 crore. Then, the original equilibrium level of real income is given by $Y = 20 + 0.5Y + 20$, *i.e.*, $0.5Y = 40$ which, on solution, gives Y = Rs. 80 crore. Let us now suppose that the planned investment expenditure increases permanently by Rs. 20 crore. As a result of this, income in period 1 rises by an equal amount, *i.e.*, Rs. 20 crore. The people who receive this income will spend a part of this income on consumer goods. The exact amount of additional consumption spending would, however, depend upon the MPC which in our case is 0.5. Therefore, the consumption expenditure in period 2 would rise by 20 × 0.5 = Rs. 10 crore. The income of the people who produced the consumer goods purchased by consumers in period 2 will, therefore, rise by Rs.10 crore in period 2. Of this, 10 ×

0.5 = 5 crore will be spent on consumer goods in period 3. This would increase income by Rs. 5 crore in period 3 of which again half, *i.e.*, 5 × 0.5 = Rs. 2.5 crore will be spent on consumer goods in period 4. This process will continue to be repeated in subsequent periods until national income rises by Rs. 40 crore. As a result, the level of income will ultimately rise from Rs. 80 crore to Rs. 120 crore.

The impact of a permanent increase in investment spending would be felt in a number of periods, though its force declines period after period. In the nth period the rise in consumption spending would be very small, say, insignificant and thus, the level of output and income would not be substantially higher than what it was in $(n-1)$th period.

The process of income propagation, caused by a permanent increase in the aggregate planned investment spending, may now be generalised as follows :

Let the marginal propensity to consume be denoted by the symbol b and ΔI stand for increase in autonomous investment. Then the increase in income in period 1 is ΔI. Increase in income in period 2 is $b\Delta I$; in period 3 increase in income is $b(b\Delta I) = b^2\Delta I$; in period $4b(b^2\Delta I) = b^3\Delta I$, and so on. In nth period the increase in income is $b^{n-1}\Delta I$.

Therefore, the total increase in income over its initial level is given by

$$\Delta Y = \Delta I + b\Delta I + b^2\Delta I + b^3\Delta I + \ldots + b^{n-1}\Delta I$$
$$= \Delta I(1 + b + b^2 + b^3 + \ldots + b^{n-1}) \quad \ldots(3)$$

Now the series in the brackets is a geometric series. To find the sum of this series, multiply both sides of (3) by b. This gives

$$b\Delta Y = \Delta I(b + b^2 + b^3 + b^4 + \ldots + b^n) \quad \ldots(4)$$

Subtraction of (4) from (3) yields

$$\Delta Y(1-b) = \Delta I(1 - b^n)$$

as all other terms cancel out.

Therefore $$\frac{\Delta Y}{\Delta I} = \frac{1-b^n}{1-b}$$

Now, if we assume that the multiplier process continues for a very long period, n can be made very large. Since b is a fraction (as MPC lies between 0 and 1, *i.e.*, $0 < b < 1$), b^n will approach zero as n becomes very large (mathematically speaking $b^n \to 0$ and $n \to$ infinity).

Then, $$\frac{\Delta Y}{\Delta I} = k = \frac{1}{1-b}$$

which is the same as (1). Thus

$$k = \frac{1}{1 - \text{MPC}} \text{ or } k = \frac{1}{\text{MPS}}$$

The Diagrammatic Presentation

To explain the process of income propagation with the help of a diagram, we use the data contained in our illustration.

In Figure 12.2, the consumption curve C is drawn with the help of the consumption function given by $C = 20 + 0.5Y$. Since the original investment is Rs. 20 crore, the $C + I$ curve is obtained by adding Rs. 20 crore onto this curve. Since I is constant, the aggreagate spending curve $C + I$ is parallel to the consumption function C. The intersection of this curve with the $C + S$ curve (the 45° line) gives the point a which yields the original level of equilibrium income Rs. 80 crore. Now the planned investment expenditure is increased permanently by Rs. 20 crore. Thus ΔI is Rs. 20 crore. Adding this to $C + I$ curve, we get the new aggregate spending curve $C + I + \Delta I$. The process of income propagation over different time periods is now as explained below.

In the first period, investment is raised by Rs. 20 crore (from a to b in the figure) and, as a result, income rises by Rs. 20 crore (*i.e.* ΔY = Rs. 20 crore in period 1.) Thus we arrive at point c. Persons receiving this income spend half of it on consumer goods. Thus consumption expenditure in period 2 rises by Rs. 10 crore and we reach the point d. The income of the people who produce these goods increases by Rs. 10 crore in period 2 and we reach the point e. Of this, half, *i.e.*, Rs. 5 crore is spent on consumer goods in period 3 and we reach point f. This increases the income by Rs. 5 crore in period 3 and we reach point g. This process continues to be repeated through different time periods until we reach the point k where the $C + I + \Delta I$ curve intersects the $C + S$ curve. As can be seen from Figure 12.2 the equilibrium level of real national income corresponding to point k is Rs.120 crore. Thus, the operation of

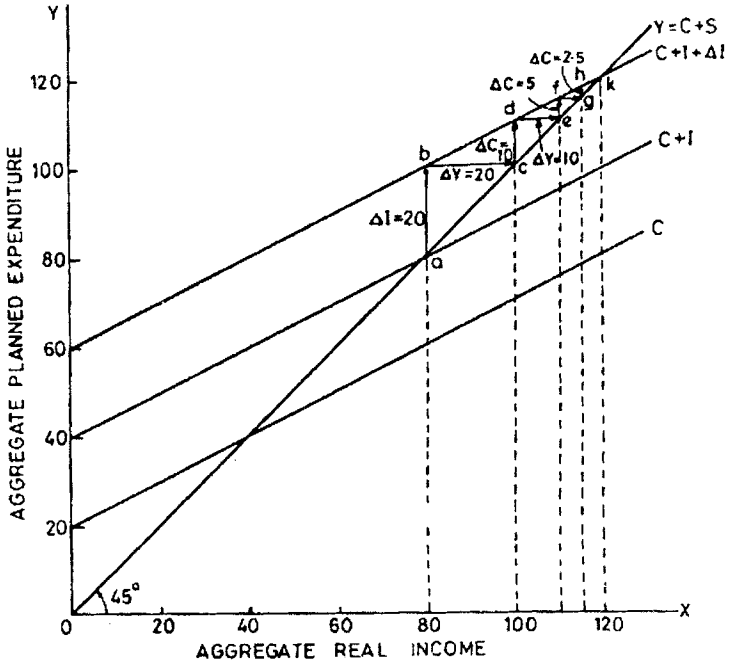

FIG. 12.2. Depiction of multiplier effect through the time period—the case of dynamic multiplier.

the multiplier ultimately results in an increase in income of Rs. 40 crore (from Rs. 80 crore to Rs. 120 crore) which is twice the increase in autonomous investment.

In the two extreme cases when MPC = 0 and MPC = 1, the value of the multiplier is 1 and infinity respectively. These two limiting cases are only of theoretical importance. In practice, whatever be the level of development in an economy, the marginal propensity to consume will never be zero, and thus any possibility of the multiplier falling to one has to be compeletly ruled out. At the same time, one should not expect the multiplier to be equal to infinity, if Keynes' assumption that the marginal propensity to consume is less than one is correct. The marginal propensity to consume is the highest in the third world countries, but even there the saving rate is not zero. Most economists believe that the actual value of the marginal propensity to consume in all cases must fall within the range from 0.33 to 0.9, and therefore the multiplier will be somewhere between 1.5 and 10.

Keynes' estimate of the multiplier, based on his knowledge of the British economy, is 3. Even now, in all probability, this estimate is valid for most developed countries under normal circumstances. As the marginal propensity to consume is relatively higher in the developing countries, the multiplier may also be higher in these countries than that in the developed countries.

THREE-SECTOR MODEL

In our discussion so far, we have been concerned with a two-sector economy. Let us now introduce the third sector in our analysis—the government sector. We know that through its expenditure and taxation policies, the government is in a position to substantially affect aggregate demand. For example, government expenditure on goods and services can directly increase aggregate demand significantly. Or, the government may increase aggregate demand indirectly through transfers, such as pensions, social security payments, welfare payments etc. which give the recipients the power to spend. On the other hand, government may also reduce aggregate demand through its taxation policy, *i.e.*, by reducing the income in the hands of consumers which could otherwise have been used to buy goods and services.

Government Expenditure Multiplier

Let us start from the relationship

$$Y = C + I + G$$

Here the consumption function is $C = a + bY_d$ where $Y_d = Y - T$. We assume that I, G and T are exogenously

determined and their values are $\bar{I}$, $\bar{G}$, and $\bar{T}$ respectively. Then the equilibrium level of national income is given by

$$Y = \frac{1}{1-b}\left(a + \bar{I} + \bar{G} - b\bar{T}\right) \qquad \text{See equation (2) of Chapter 11.}$$

Let us now start from a situation where the initial government expenditure is $\bar{G}_1$ and corresponding to it, the equilibrium level of national income is Y_1. Then,

$$Y_1 = \frac{1}{1-b}\left(a + \bar{I} + \bar{G}_1 - b\bar{T}\right)$$

Let us now suppose that the government expenditure rises from $\bar{G}_1$ and $\bar{G}_2$. Then the new equilibrium level of income will be given by

$$Y_2 = \frac{1}{1-b}\left(a + \bar{I} + \bar{G}_2 - b\bar{T}\right)$$

on subtraction we get

$$Y_2 - Y_1 = \frac{1}{1-b}\left(\bar{G}_2 - \bar{G}_1\right)$$

or

$$\Delta Y = \frac{1}{1-b}\Delta G$$

which gives the value of the governement expenditure multiplier as

$$k_g = \frac{\Delta Y}{\Delta G} = \frac{1}{1-b} \qquad ...(5)$$

which is the same as the value of the investment multiplier obtained earlier.

Diagrammatic Depiction. In Figure 12.3, the initial equilibrium level of income is Y_1. The governement expenditure here is $\bar{G}_1$ while investment is given by $\bar{I}$ and taxation by $\bar{T}$.

Let us now suppose that government expenditure increase to $\bar{G}_2$. The new aggregate demand curve is $C + \bar{I} + \bar{G}_2$ which cuts the 45° line at point F which is the new point of equilibrium. Thus the equilibrium level of national income rises from OY_1 to OY_2. As can be seen from the figure $Y_2 - Y_1$ (*i.e.*, ΔY) $> \bar{G}_2 - \bar{G}_1$ (*i.e.*, ΔG) because $FR > FS$. Thus, as in the case of the investment multiplier, the government expenditure multiplier is greater than unity. Hence, we conclude that a given change in autonomous government expenditure will lead to a change in income larger than itself.

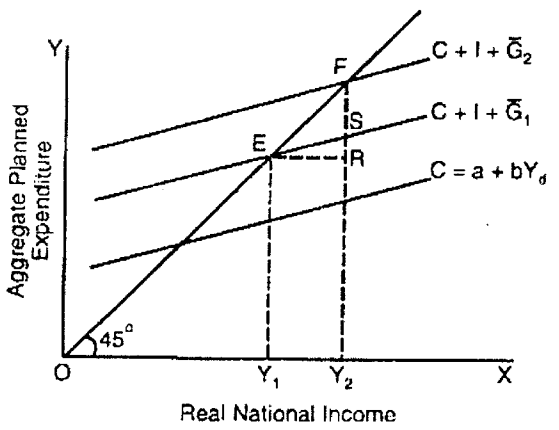

FIG. 12.3. The multiplier effect of an increase in government expenditure