MICRO ECONOMICS - II

I M.A (Economics)

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MICRO ECONOMICS – II

COURSE CODE: 18KP2EC05

Credit : 5
Hours / Week : 6
Medium of Instruction : English

Unit - I : Theories of Distribution

Marginal productivity Theory. Micro theories of distribution - Recardian. Maxian. Kaleeki and Kaldor's.

Unit - II : General Equilibrium

Partial and general equilibrium - one sector model - homogenous functions. income distribution. production without consumption - two sector model. 2*2*2 model.

Unit - III : Welfare Economics

Old Welfare Economics - Adam Smith. Marshall. Pigouviyan Welfare Economics.

Unit - IV : New Welfare Economics

Kaldor - Hicks - Scitovsky - Arrow - Social welfare Function - Rawl's - Sens's Theory of Social choice- Pareto's optimality criterion.

Unit - V : Economics of Uncertainty

Individual behaviour towards risk. expected utility and certainty equivalence approaches. risk and risk aversion.

REFERENCE BOOKS

1. Kreps. David. M. (1990) A course in micro economic theory. Princeton University press Princeton.
2. Koutsoyiannis.A (1979) Modern micro economics (second edition) Macmillan press London.
3. Layard P R and A W Walters (1978) micro economic theory McGraw Hill. New york.
4. Sen A (1999) Micro economics theory and application. oxford university press New Delhi

8/3/18

UNIT - I

PART FIVE

FACTOR PRICING

Chapter 35

Macro-Theories of Distribution

1. PERSONAL DISTRIBUTION AND FUNCTIONAL DISTRIBUTION

The term 'distribution' in economics refers to personal distribution and functional distribution of income. Personal distribution relates to the forces governing the distribution of income and wealth among the various individuals of a country. Under personal distribution, we study the pattern of the distribution of national income and the shares received by the different classes. What is the share of the wage-earning class, of the rentier class, and of the entrepreneurial class in the national income? Why is the share of the wage-earning class in the national income lower than the other classes? Why is the wage of one person higher (or lower) than the other? Why is the rent of one piece of land or house higher (or lower) than the other? These and other similar problems are studied under personal distribution of income. In other words, under personal distribution of income we study the problem of inequality of income and wealth, its effects, and measures to remove or lessen inequalities. In the words of Jan Pen: "*Personal distribution* (or: the 'size distribution of income') relates to individual persons and their incomes. The *way in which* that income was acquired often remains in the background. What matters is how much someone earns, not so much whether that income consists of wage, interest, profit, pension or whatever. And further special attention is paid to income recipients as a collective body, in which regular patterns are sought."[1]

Functional distribution or 'factor share distribution' explains the share of total national income received by each factor of production. In other words, it relates to the distribution of rewards for the services of the factors of production. Rent, wages, interest and profit are the rewards for the services of land, labour, capital and organisation respectively. Algebraically, it can be stated as: $P = f(A, B, C, D)$, where the total output P is a function 'f' of A land, B labour, C capital, and D organisation. Thus functional distribution studies the forces underlying the determination of the prices and shares of the various factors of production. To quote Jan Pen again: "In *functional distribution*. . . we are no longer concerned with individuals and their individual incomes, but with factors of production: labour, capital, land and something else that may best be called 'entrepreneurial activity'. The theory examines how these factors of production are remunerated. It is primarily concerned with the price of a *unit* of labour, a *unit* of capital, a *unit* of land, and being therefore an extension of price theory. . . it is sometimes called the theory of

[1] Jan Pen, *Income Distribution*, 1971. Italics in original.

factor prices."[2]

Despite these apparent differences between personal distribution and functional distribution, there is close relation between the two. The personal distribution in a country is ultimately affected by its functional distribution of income. If the rewards to the factors of production are just and equitable, the distribution of personal income is also just and equitable. As a result, individual incomes are high. There is great demand for products and services leading to more investment, more employment and to increased production and national income. Higher personal incomes mean higher standard of living and greater efficiency in production. On the other hand, if the functional distribution of income is unjust and is based on the exploitation of factors of production, the personal distribution of income is also unjust and inequitable. As a result, the majority of the people will be poor. There will be diminution of economic and social welfare, and loss of peace and prosperity in the country due to a continuous struggle between the rich and the poor. In this chapter we shall be concerned with the problem of functional distribution.

The problem of determining factor prices has been the subject of discussion from the Classicists to the Neo-Keynesians, but without any unanimity. Prof. Kaldor[3] has divided the different theories of distribution into four main groups: the Ricardian or the Classical Theory; the Marxian Theory; the Neo-Classical or Marginalist Theory which is sub-grouped into (*a*) Marginal Productivity, and (*b*) the Degree of Monopoly theories, and the Keynesian Theory[4]. These theories are discussed in the subsequent sections.

2. THE RICARDIAN THEORY

Ricardo's theory of distribution is based on his principle of differential rent as applied to the economic system as a whole. The underlying assumptions of the model are:

(*i*) that the entire land is used in producing corn and the forces operating in agriculture serve to determine distribution in industry;

(*ii*) that land is subject to the law of diminishing returns;

(*iii*) that it is fixed in supply;

(*iv*) that the demand for corn is perfectly inelastic;

(*v*) that capital and labour are *one* variable input (fixed coefficients);

(*vi*) that the state of technical knowledge is given, and there are no agricultural improvements;

(*vii*) that all labourers are paid a subsistence wage;

(*viii*) that the supply price of labour is constant and given;

(*ix*) that the demand for labour depends upon the accumulation of capital. This as well as the supply price of labour are independent of marginal productivity of labour;

(*x*) there is perfect competition.

[2] *Ibid*. Italics in original.

[3] Nicholas Kaldor, "Alternative Theories of Distribution", *R.E.S.*, Vol. XXIII, No. 2, 1955-56. Reprinted in *Essays on Value and Distribution*, 1960.

[4] For theories relating to "Share of Wages in National Income", see Ch. on Wages.

Prof. Kaldor explains the Ricardian theory in terms of the "marginal principle" and the "surplus principle." The "marginal principle" explains the share of rent in the national output and the "surplus principle" the division of the remaining share between wages and profits.

Given the total output of corn, the share of each factor can be determined. Rent per unit of labour is the difference between the average and the marginal product of labour. Or, total rent is the difference between the average product and the marginal product of labour *multiplied* by the amount of labour and capital applied to land. Profit is the difference between the marginal product of labour and the wage rate. The wage rate is determined on the basis of the Wage Fund multiplied by the number of labourers employed at the subsistence level. Thus out of the total corn produced and sold, rent is the first claim, and the residue (produce minus rent) is divided between wages and profits, interest being included in the latter. This is shown in Figure 35.1 where the vertical axis measures quantities of corn and horizontal axis, the amount of labour and capital employed in agriculture. The curve *AP* represents the average product of labour and *MP* the marginal product of labour. With *OM* amount of (capital and labour), *OQRM* total corn is produced. When *OM* labour is employed, its average product is *RM* and marginal product is *TM*. Rent per unit of labour being the difference between *AP* and *MP* is *RT* (= *RM* – *TM*). Total rent is shown by the rectangle *PQRT*, i.e., *RT* × *PT*, rent per unit multiplied by the number of labourers employed (*OM* = *PT*). Thus out of the total output of corn *OQRM*, output *PQRT* goes to the landlord as rent. The remaining output *OPTM* will be divided between labour and capital.

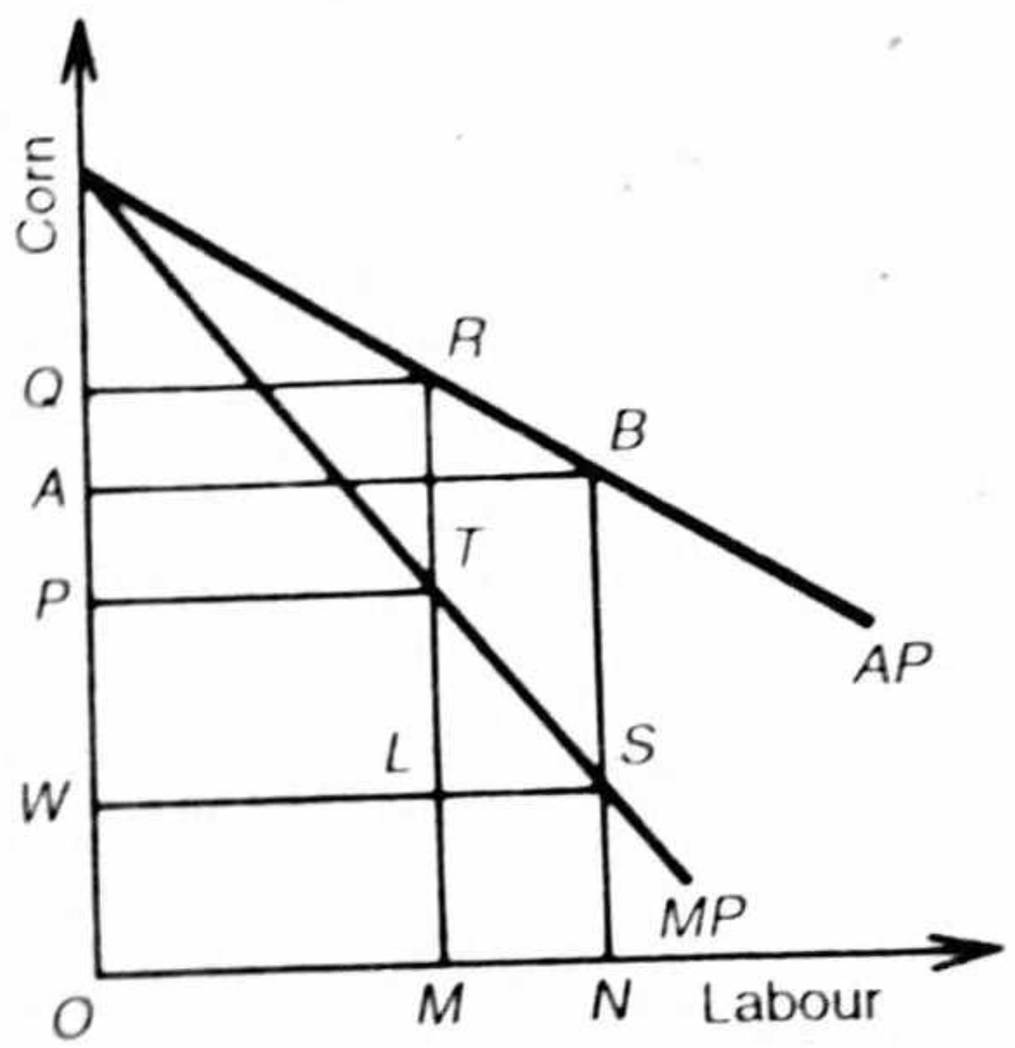

FIG. 35.1

The share of labour, according to Ricardo, is determined by the subsistence wage. In the figure, *OW* is the subsistence wage per labourer who needs a minimum of *OW* amount of corn for his subsistence. *WL* is the supply curve of labour which is infinitely elastic at *OW* subsistence wage rate. Thus *OWLM* (the number of labourers employed *OM* × *OW* the wage rate) is the share of labour in total output. The remaining output *WPTL* is profits. Profits equal the total product (*OQRM*) *minus* rent (*PQRT*) *minus* the wage bill (*OWLM*). Algebraically, *WPTL* = *OQRM* – (*PQRT* + *OWLM*).

If the share of labour *OWLM* increases, it will be at the expense of the rate of

profits which will start falling. When wages rise, profits necessarily fall. This may happen when protection is granted to agriculture, or taxes are levied and raised on manufacturing industry. (iii) *LM* also increases in the case of technical progress. Technical progress tends to shift the *MP* and *AP* curves upwards to the right. As a result the rate of profit and wage rate rise. The latter induces increase in population and the demand for corn which in turn raises the price of corn. To meet the increased demand for corn, more labour is employed but at higher wages. True only adequate and permanent cause for the rise in wages, according to Ricardo, is the increasing difficulty of providing food and necessaries for the increasing number of men. This results in the rise of labour costs, fall in the *MP* and *AP* of labour and the operation of the Law of Diminishing Returns. These factors tend to raise the price of corn further which in turn raises rents. In between the increase in rents and wages, the profits continue to be squeezed till they disappear. This is explained in Figure 35.1 when the amount of labour increases from *OM* to *ON* and the total output is *OABN*. Out of this, *OWSN* is the total wage bill and *WABS* is the rent. There are no profits at all.

According to Ricardo, there is a natural tendency for the profit rate to fall in the economy, so that the country ultimately reaches the stationary state. When capital accumulation rises with increase in profits, total output increases which raises the wages fund. With the increase in the wages fund, population increases which raises the demand for corn and its price. As population increases, inferior grade lands are cultivated to meet the increasing demand for corn. Rents on the superior grades of land rise and absorb a greater share of the output produced on these lands. This reduces the share of capitals and labourers. Profits decline and wages tend to fall to the subsistence level. This process of rising rents and declining profits continues till the output from the marginal land just covers the subsistence wage of the labour employed. Then profits are zero. The stationary state arrives. In this state, capital accumulation stops, population does not grow, the wage rate is at the subsistence level, rent is high and economic progress stops.

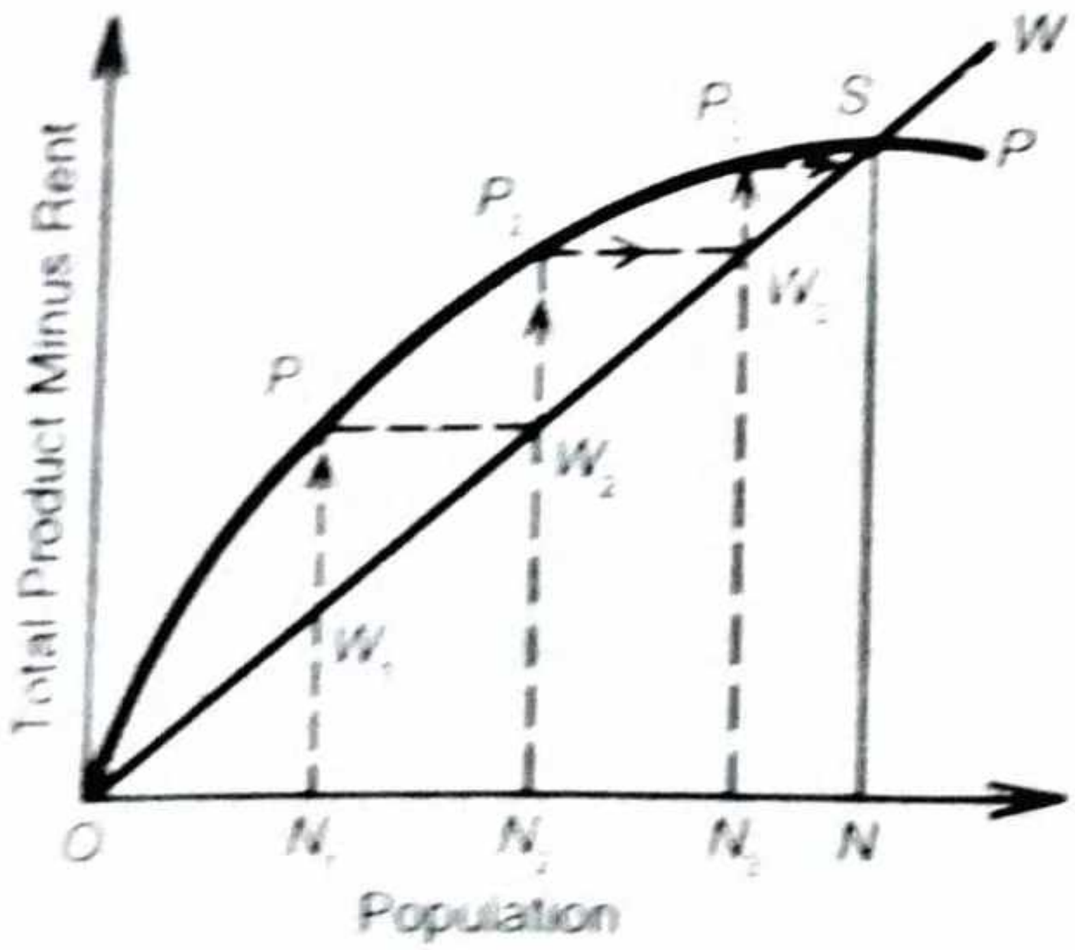

FIG. 35.2

The movement towards the stationary state in the Ricardian model is explained in terms of Fig 35.2. Population is measured along the horizontal axis and the total product minus rent on the vertical axis. The curve *OP* is the production function which shows total production minus rent as the function of population. As population increases, the *OP* curve flattens out due to

the operation of the law of diminishing returns. The ray through the origin OW measures the constant real wage rate. The vertical distance between the horizontal axis and the wage rate line OW measures the total wage bill at different levels of population. Thus W_1N_1, W_2N_2, and W_3N_3 are the total wage bills at ON_1, ON_2 and ON_3 levels of population. When the wage bill is W_1N_1, the profits are P_1W_1 (Total product minus rent − the total wage bill, *i.e.*, $P_1N_1 - W_1N_1 = P_1W_1$.) When profits are P_1W_1, investment is encouraged. The demand for labour increases to ON_2, which pushes up the wage bill to W_2N_2 but profits decline to P_2W_2. This will encourage further investment and technical progress and raise the demand for labour to ON_3 and the wage bill will also increase to W_3N_3. But the profits will decline to P_3W_3. This process of capital accumulation, increase in population and the wage bill will continue till profits disappear altogether at point S from where the stationary state sets in. In such a situation, profits disappear altogether and the entire output is distributed between rent and wages.

Its Criticisms

The Ricardian theory is not free from criticisms.

1. *Not a Functional Theory*. The Ricardian theory of distribution is the three-factor theory which determines the shares of three fairly distinct classes, the labourers, landlords and the capitalists. In determining the share of each, Ricardo assumed land to be the main benefactor and treated the shares of labour and capital as a residual. This was a wrong approach for it failed to present a functional theory of distribution, determining the reward of each factor separately on the basis of its service.

2. *Land does not Produce Corn only*. It is assumed that land is available for the production of only one commodity, corn. This is, however, a primitive notion. More so when we say that the produce of land alone supports the other factors of production.

3. *Capital and Labour Independent Factors*. The assumption that capital and labour are fixed coefficient is untenable. The very fact that capital and labour are independent movable factors, contradicts this assumption.

4. *Interest Separate from Profits*. One of the serious defects of Ricardo's theory of distribution is that it does not treat interest as a separate reward. Interest is supposed to be included in profits. This misconception stems from the thought that the capitalist and the entrepreneur are not separate identities. In reality, the entrepreneur is the driving force who employs and directs both capital and labour.

5. *Neglects the Role of S & T*. The Ricardian theory is primarily based on the law of diminishing returns. Rapid increase of farm produce in the advanced nations has proved that Ricardo underestimated the potentialities of technological progress in counteracting diminishing returns to land. Ricardo gave unnecessary importance to the law of diminishing returns and failed to visualize the important impact that science and technology (S & T) had on the rapid economic development of the now developed nations.

6. *Wages Rise with Population Increase*. The Ricardian view that the wage rate does not increase with the rise in population has been disproved. *First*, the Malthusian theory of population has been proved wrong by population trends prevailing in the Western World. *Second*, wages have not tended to be at the subsistence level,

Rather, there has been a continuous increase in money wages, and population has tended to decline.

7. *Neglects Competitive Pricing of Land.* This theory has little value as it does not approach the problem of rewarding the factors of production in terms of supply and demand and of economic organization through competitive pricing.

Conclusion. Despite these weaknesses, Ricardo's interest lay, according to Prof. Kaldor, not only in the problem of distributive shares, but in the belief that the theory of distribution held the key to an understanding of the working of the economic system, that is, of the forces governing the rate of progress, the effects of protection, the ultimate incidence of taxation, etc. It was through "the laws which regulate distributive shares" that Ricardo was trying to build what we would call these days "a simple macro-economic model". In this respect there is similarity between the Ricardian and the Keynesian theories of distribution.

3. THE MARXIAN THEORY

Marx's theory of distribution is mainly an adaptation of the "surplus principle" in Ricardo's theory.

The Marxian theory is based, on the analysis of surplus value. Labour power is like any other commodity. Its value is the amount of labour that it takes to produce the means of subsistence necessary for the maintenance of the labourer. In fact, labour-power produces more than this. The value of the commodities necessary for the subsistence of labour is never equal to the value of the produce of that labour. If a labourer works for a ten-hour day but it takes him six hours' labour to produce goods to cover his subsistence, he will be paid wages equal to six hours' labour. The difference worth four hours' labour goes into the capitalist's pocket in the form of *net profits, rent and interest.* Marx calls this unpaid work "surplus value" and the extra labour for which the labourer receives nothing, "surplus labour". This surplus labour augments the capitalist's profits who tries to increase the surplus by prolonging the working day, by diminishing the number of hours required to produce the labourer's sustenance and by increasing the productivity of labour through technological change (introducing labour-saving devices).

Of the three methods, according to Marx, increase in the productivity of labour is the likely choice of the capitalists, since the other two methods, of extending the working hours and reduction of wages, have limitations of their own. So in order to make improvements in the productivity of labour, the capitalists save the surplus value, reinvest it in acquiring a large stock of capital and thus accumulate capital. "Accumulate, accumulate! That is Moses and the Prophets" and "Save, save i.e. reconvert the greatest possible portion of surplus value or surplus product into capital." These are the capitalist's mottos. According to Kaldor, for Marx accumulation by capitalist enterprise is not a matter of choice but a necessity, due to the competition among the capitalists themselves. This, in turn, was explained by the existence of economies of large scale production (together with the implicit assumption that the amount of capital employed by any capitalist is governed by his own accumulation). Given the fact that the larger the scale of operations the more efficient the business, each capitalist is forced to increase the size of his business through the reinvestment of his profits if he is not to fall behind in the

competitive struggle.

Profits are also determined by the amount of capital. As Marx says, "Capital is dead labour, that vampire like, only lives by sucking living labour and lives the more, the more labour it sucks." To explain the origin of profit and to analyse the relation between wages and profits, he separates capital into "constant" and "variable" capital. Constant capital (c) refers to raw material, machines etc., which directly assist the productivity of labour. Capital devoted to the purchase of labour-power in the form of wages is termed as variable capital (v). The surplus value is denoted by s. So the total value of product = constant capital (c) + variable capital (v) + surplus value (s) or $(c + v) + s$. It is the variable capital which is the main source of surplus value while the value of machines is gradually passed on to the product.

The ratio of constant to variable capital c/v, is termed as the "organic composition of capital." The rate of surplus value is defined as s/v, the ratio of surplus value to variable capital or of profits to wages. This is known as the degree or rate of exploitation. This leads Marx to point out that the rate of profit is not dependent solely on the rate of surplus value. The rate of profit can change even though the rate of surplus value remains constant, if a change occurs in the organic composition of capital. The influence of technical progress is to alter the organic composition of capital, generally (though not invariably) in the direction of raising the ratio of constant to variable capital. Hence the tendency of industrial progress is to lower the rate of profit r—even though there is no decrease in the rate of surplus value.[5]

One of the consequences of capital accumulation is the concentration of capital in big enterprises. Competition among capitalists forces them to cheapen their products. This can be done by introducing labour-saving machines which increase labour productivity. Those capitalists who are unable to replace labour by machines are 'squeezed out' and their enterprises are taken over by big capitalists. Capital accumulation and concentration involve increase in constant capital and decline in variable capital. The rapid growth of constant capital as compared with variable capital leads to a relative decrease in the demand for labour. This process of replacing labour by machines creates an "industrial reserve army" which increases as capitalism develops. The larger the industrial reserve army, the worse are the conditions of the employed workers, since the capitalist can dismiss dissatisfied and troublesome workers, being able to replace them from the ranks of the reserve army. Capitalists are also able to cut down wages to a semi-starvation level and appropriate more and more surplus value. This is the law of the 'increasing misery' of the masses under capitalism.

But when the capitalist is replacing the workers by machines, he is killing the goose that laid the golden eggs. There is a continual reduction of the surplus value. Marx believes that technological progress tends to increase the organic composition of capital (c/v). Since the rate of profit is inversely related to the organic composition of capital, the former tends to decline with accumulation. Marx explained this tendency of falling rate of profit in terms of the following equation:

[5] Maurice Dobb, *Political Economics and Capitalism*, pp. 96-97.

$$r = \frac{s}{c+v} = \frac{s/v}{c/v+1}$$

The rate of profit (r) varies inversely with the organic composition of capital (c/v) and directly with the rate of surplus value (rate of exploitation s/v). Therefore, the rate of profit r rises with the rate of surplus value s/v and falls with the organic composition of capital c/v. This is Marx's law of falling tendency of the rate of profit.

This is explained in Figure 35.3. The Marxian analysis is based on the assumption that as the capitalists employ more capital, they keep the labour-supply constant. In the Figure, the amount of capital is taken on the horizontal axis and total output on the vertical axis. The total product curve OP rises at an increasing rate upto point A and thereafter at a decreasing rate. This means that given the labour supply as constant, the law of diminishing returns starts operating after point A. The constant wage rate is shown by the horizontal line TW which reflects constant labour-supply with increasing use of capital. A tangent TT_1 is drawn at point A from where a perpendicular AK_1 cuts the line TW at S_1. Similarly, another line TT_2 is drawn from point T which intersects the total product curve from below at point B from which a perpendicular BK_2 is drawn which cuts TW at S_2.

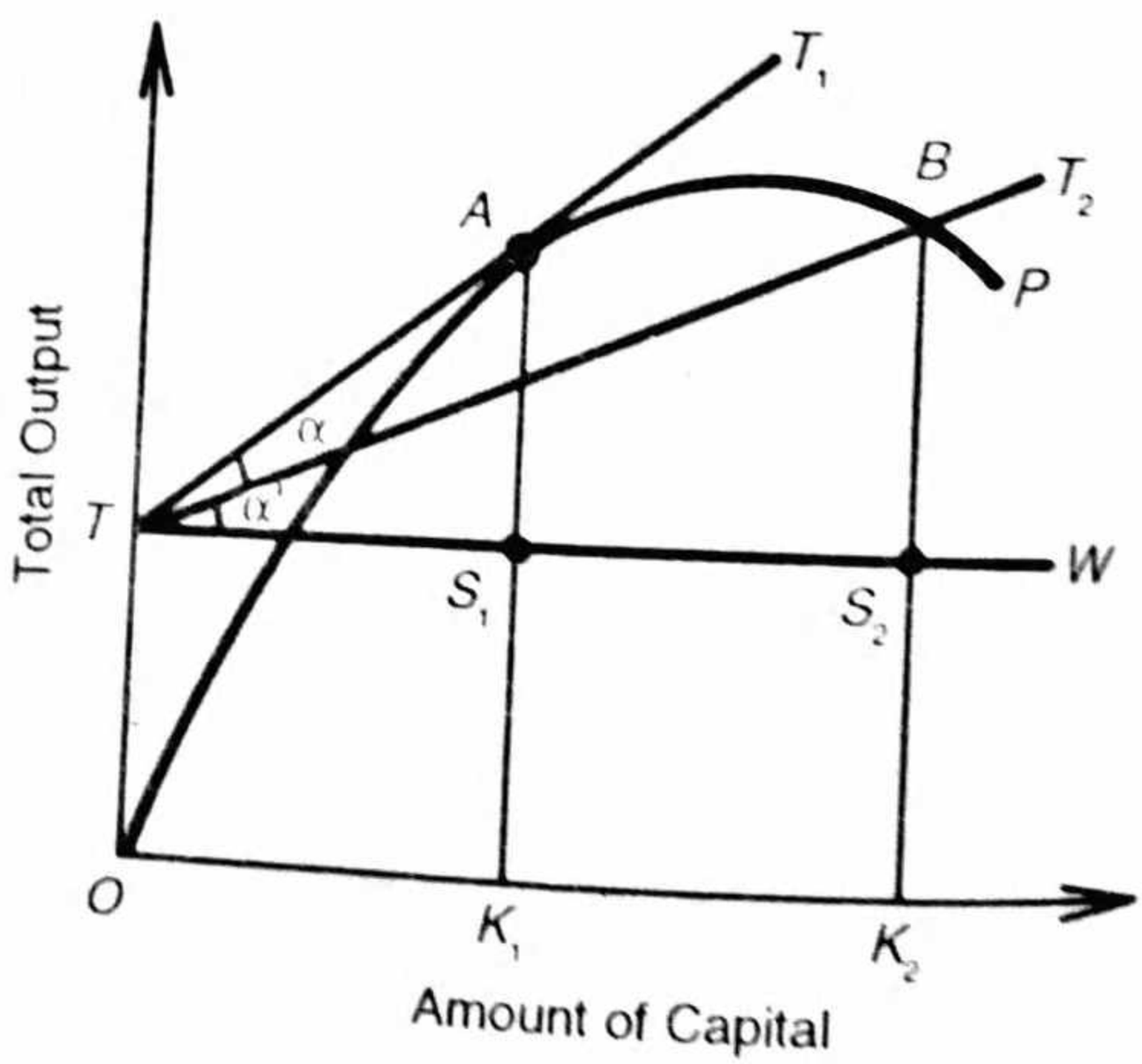

FIG. 35.3

Now when OK_1 quantity of capital is used on machines, the total output is equal to AK_1 and the entrepreneurs earn AS_1 total profits and the profit rate is $\tan \alpha = AS_1/TS_1$. If entrepreneurs employ more capital than OK_1 in the expectation of earning more profits, the total profits decline from AS_1 *to* BS_2 and the profit rate also falls from $\tan \alpha = AS_1/TS_1$ to $\tan \alpha' = BS_2/TS_2$. Thus with the use of more capital on machines, the profit rate falls.

In this way, the same rate of surplus-value, with the same degree of labour exploitation, would express itself in a falling rate of profit, because "as technical progress tends to substitute stored-up labour for living labour, the rate of the profit yielded by a given rate of surplus value will fall, that is, the rate of profit will fall *unless* rate of exploitation of living labour is correspondingly increased."[6] In order to counteract this tendency of declining rate of profits the capitalists increase the degree of exploitation by reducing wages, lengthening the working day, and by "speed ups", etc. But since every capitalist is engaged in introducing new labour-saving and cost-reducing devices, the ratio of labour (and hence surplus value) to total output falls still further. The rate of profit declines all the more. This process continues till profits are wiped out and crisis starts.

Its Criticisms

Certain defects of the Marxian analysis are quite apparent.

1. *Rent and Interest as Separate Rewards.* He does not treat rent and interest as separate rewards but as "a mere fragment of surplus value."

2. *Does not discuss Role of Entrepreneur.* The role and importance of entrepreneurial functions is not discussed for the determination of profits.

3. *Inherent Contradictions in the Law of Organic Composition of Capital.* The Marxian law of the "increasing organic composition of capital" suffers from inherent contradictions. If variable capital is the source of all profit, then it is useless to introduce constant capital like machines. Marx realises this "contradiction which is imminent" but offers no solution.

4. *Law of Falling Rate of Profit cannot be derived from the Law of Organic Composition of Capital.* As pointed out by Prof. Kaldor it is not possible to derive the law of the falling rate of profit from the law of the organic composition of capital. When as the result of increase in organic composition of capital, output per head rises, it will not lead either to a lower or a higher rate of profit since Marx assumes the supply price of labour (wage rate) to remain unchanged.

5. *Falling Tendency of Profits not Correct.* According to Joan Robinson, Marx's "explanation of the falling tendency of profits explains nothing at all." Marx contends that as development proceeds, there is an increase in the organic composition of capital which brings about a decline in the profit rate. But Marx failed to visualize that technological innovations can be capital-saving too, and that with a fall in capital-output ratios and increases in productivity and total output, profits can rise along with wages.

Differences with Ricardian Theory

Marx's theory of distribution is mainly an adaptation of the "surplus principle' in Ricardo's theory. Prof. Kaldor points out certain fundamental differences between the two:

(*i*) Marx does not believe in the Law of Diminishing Returns and, therefore, makes no distinction between rent and profit; he includes in it the share of profits. But Marx like Ricardo treats interest as a part of profits.

(*ii*) Marx assumes the supply price of labour to be fixed in terms of commodi-

[6] M. Dobb, *On Economic Theory and Socialism*, p. 193.

ties in general, while Ricardo considers the wage rate to be fixed in terms of com

(iii) For Ricardo, profits are the difference between rent and wages, but Marx regards profits as the surplus product of labour over the supply price (wages or cost) of labour.

(iv) In the Ricardian theory wages are paid equal to the subsistence level out of the Wages Fund, but in the Marxian analysis the 'reserve army of labour' (the unemployed which always exist in society) prevents the wage rate from rising above the subsistence level.

(v) Another difference between the two approaches is over the motive underlying capital accumulation. For Ricardo, the capitalists accumulate for the lure of a high rate of profit, but for Marx capitalists accumulate as a matter of necessity due to competition among themselves.

Lastly, Ricardo regards the tendency of a falling rate of profit due to the operation of Law of Diminishing Returns, but for Marx this tendency is based on the law of the 'increasing organic composition of capital' (the ratio of fixed to circulating capital).

4. THE MARGINAL PRODUCTIVITY THEORY OF DISTRIBUTION

The marginal productivity theory is, in fact, the neo-classical theory of distribution derived from the "marginal principle" of the Ricardian theory of distribution.

Explanation. According to this theory, the reward of a factor equals its marginal product. Marginal product, also known as marginal physical product, is the increment made to the total output by employing an additional unit of a factor keeping all other factors constant. If this increase in output is multiplied by the prevailing price of the product, the result is the marginal value product of that factor. But Prof. Machlup observes: "By measuring units of factors in terms of their market value, marginal productivity analysis is reduced *ad absurdum*. One must bear in mind that marginal productivity analysis as a part of the theory of distribution is to serve as explanation of the market values of factors or services. To define these services in terms of their market values is to risk the task of explaining them".[1] It is, therefore, better to measure marginal product of a factor in terms of its marginal revenue product which may be defined as the addition made to total revenue resulting from the employment of one more unit of a factor of production, other factors remaining unchanged.

As a general rule, the marginal revenue productivity of a factor diminishes with the increase in the units of that factor-service. When in the initial stages the units of a variable factor are employed, keeping the other factors constant, the total revenue product may increase more than proportionately for some time. But, sooner or later, a time will come when the marginal revenue product will start diminishing, and will tend to equal the price of the factor service. This tendency of diminishing MRP follows from the Law of Variable Proportions.

A firm operating under perfect competition has to pay the same price (reward) to a unit to the factor, which is being paid by the industry. In order to have maxi-

[1] F. Machlup, "On the Meaning of Marginal Product", in *Readings in the Theory of Income Distribution*, pp. 164-5.

maximum profits, it acts on the principle of substitution. Cheaper factor-services tend to displace expensive ones. For example, if a firm finds it more profitable to substitute machines for costly labour it will do so. The substitution of cheaper factors for the dearer will continue till the marginal revenue productivity of each factor is equal to its price. At this stage, the factors of production are employed in their most efficient combination or the least cost combination and the profits of the firm will be maximized.

In equilibrium, therefore, the price of a factor-service must equal its marginal revenue productivity. If the marginal revenue product of a factor unit is more than its price (cost of employing it), it will be profitable for the firm to employ more units of this factor. As more units are employed the marginal revenue product diminishes till it equalises the price. This is the point of maximum profits for the firm. But if more factor units are employed beyond this point, the marginal revenue product will fall below the price and the firm will sustain a loss. (This follows from the application of the law of non-proportional returns.)

Moreover, substitution also takes place between different units of the same factor-service. There being perfect mobility in the factor-market, units of a factor-service tend to move from one use where their marginal revenue productivity is low to another use where it is high, till it is equalized for all the units in different uses.

In the ultimate analysis, however, the price of a factor-unit must equal its marginal as well as average revenue productivity.[8] If at any time the price of a factor-unit is higher than average revenue productivity, the firms will be incurring losses. As a result, some of the firms will leave the industry thereby the price of the factor service will fall to the level of the maximum average revenue productivity. On the contrary, if the price is less than average revenue productivity, the firms will be enjoying extra profits. Attracted by these excess profits, new firms will enter the industry and compete for this factor-service. This will tend to push the price upwards to the level of average revenue productivity. There can be a deviation from this equilibrium position in the short-run, but in the long-run the price of a factor service must equal its marginal and average revenue productivity. This is shown in the Figure 35.4.

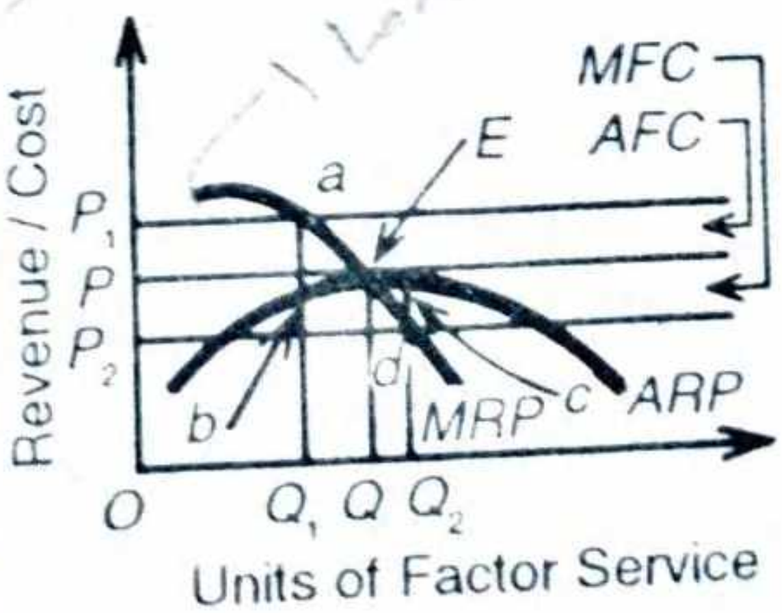

FIG. 35.4

At point *E*, ARP = MRP, and both are equal to the average reward (average factor cost) and marginal reward (marginal factor cost) of the factor service. Thus each factor service will be paid *OP* price for *OQ* units. Suppose the factor-price rises to OP_1. At this price firms will be incurring *ab* per unit of loss, as the price being paid to factor-units is greater than their average revenue productivity (ARP). This will induce some firms to leave the in-

[8] Average revenue productivity is total revenue productivity divided by the total employed factor-units of a service.

dustry and the factor-price would again fall down to E. On the other hand, if factor-price falls to OP_2, firms will be gaining dc per unit profit. When attracted by it some new firms enter the industry, price will again rise up to OP. These price variations are only possible in the short-run. In the long-run equilibrium position E will stay on.[9]

Assumptions of the Theory

The marginal productivity theory of distribution is based on a number of assumptions:

(*i*) It assumes that all units of a factor-service are homogeneous;
(*ii*) They can be substituted for each other;
(*iii*) That there is perfect mobility of factors as between different places and employment;
(*iv*) That there is perfect competition in the factor market and commodity market;
(*v*) That there is full employment of factors and resources;
(*vi*) That the various units of the different factor-services are divisible;
(*vii*) That the entrepreneurs are motivated by profit maximization;
(*viii*) That the theory is applicable in the long run; and
(*ix*) That it is based on the Law of Variable Proportions.

Its Criticisms

The marginal productivity theory of distribution has been one of the most criticised theories in economics due to its unrealistic assumptions.

(1) *All units of a Factor are not Homogeneous*. The assumption that all units of a factor-service are homogeneous is unrealistic. We know that efficiency of labour differs from worker to worker. Similarly, one piece of land differs from the other in fertility. It is, therefore, not correct to assume that the different factor-units of the same service are homogeneous. In fact, heterogeneity and not homogeneity is the rule. It follows that since no two factor-units are homogeneous, they are non-substitutable for each other. A textile engineer cannot be put in place of a sugar technologist.

(2) *Factors are not Perfectly Mobile*. The theory assumes perfect mobility of factors as between different employments and places. But in reality factors are mostly immobile. There is no automatic movement of factor-units from one industry or place to another. The greater the degree of specialisation in an industry, the less is the factor mobility from one industry to another. That is why factor-units of the same service or even of different services are not paid equal to their marginal productivities in every occupation and at all places.

(3) *There is no Perfect Competition*. The theory is based on another unrealistic assumption of perfect competition which is to be found neither in the factor market nor in the commodity market. Perfect competition is not a reality but a myth. Rather imperfect competition or monopolistic competition is the rule which leads to the exploitation of factors as they are paid much below their marginal produc-

[9] This can also be explained in terms of Figure 37.2 (A), (B), (C) of Chapter 37.

mity. Prof. Chamberlin has however applied the marginal productivity theory to imperfect competition.

(4) *Factors are not Fully Employed.* The theory assumes the existence of full employment in the economy. Otherwise in case of unemployment, factor-units will offer their services even at a price less than their marginal product. This assumption of full employment makes the theory static. On the contrary, Keynes has shown that under-employment rather than full employment is found in an economy and that total-employment depends upon effective demand in a community. The marginal productivity theory is at the most applicable to a firm.

(5) *All Factors are not Divisible.* The assumption that factor-units are divisible and therefore can be increased by small quantities does not hold true. It is not possible to vary an individual, large or lumpy factor. For example, how can the entrepreneur of a firm be increased or decreased by small units? Moreover in the case of a large factory the addition or subtraction of one factor unit will have practically no effect on the total productivity. It may be true in domestic production. Thus the equality between marginal productivity and prices of factors cannot be brought about by varying their quantities a little less or more.

(6) *Production is not the Result of One Factor Alone.* Another criticism which follows from the preceding point is put forth by Taussig and Devonport that production of a commodity cannot be attributed to any one factor, land, labour or capital. Rather it is always the result of factors and their units working together. It is therefore not possible to calculate the marginal productivity of each factor-unit separately.

(7) *Profit Motive is not the Main Motive.* The theory assumes that the entrepreneurs are motivated by maximization of profits, that is why more units of a factor-service are employed when the firm finds the marginal revenue product of the service is higher than its price. But, as pointed out by *Schumpeter*, the entrepreneurial action is guided by the desire to found a commercial kingdom, the will to conquer, the joy of creating and getting things done. It is therefore not true to say that the entrepreneur is guided by the profit motive.

(8) *Not Applicable in the Short-run.* The theory is applicable only in the long-run, when the rewards of the factor services tend to equal their marginal revenue product. But in reality we are concerned with short-run problems. As remarked by Keynes, "In the long run we are all dead": This assumption makes the problem of pricing the factor-services unrealistic.

(9) *Neglect of Technical Progress.* The marginal productivity theory fails to throw light on the determination of relative shares by neglecting the influence of technical change. Prof. Hicks has shown that a labour-saving innovation tends to raise the marginal product of capital relative to that of labour. The opposite may happen in the case of capital-saving innovation. But sometimes a technical change requires the use of cooperating factors in fixed proportions, say two workers for one machine. Even an abundant and cheap labour cannot induce employers to employ more than two workers on that machine. Thus the marginal productivity theory fails to analyse the problems of technical change.

(10) *Supply of Factors is not Fixed.* This theory of distribution assumes the supply of factors to be perfectly inelastic, i.e., as given quantities. The supply of factors is fixed during the short period and not in the long-run. Therefore, the

theory is self-contradictory. For it assumes the supply of factors to be fixed in the long-run to which it applies. Moreover, being a theory solely of the demand for factors, it cannot be applied to the factor market as a whole which requires a theory of both the demand for and supply of factors.

(11) *No Justification for Inequalities in Income*. The marginal productivity theory is often used to justify the existing inequalities in the distribution of income. The theory states that the price of each factor equals its marginal revenue product which makes the reward inevitably what it is. Apparently, a person gets what he produces. The basic postulate rests on the proposition that an individual gets what is produced by the resources he possesses and that all persons have equal opportunities. But no two persons possess the same resources and have equal opportunities. Thus the existing distribution of income cannot be justified on the basis of the principle of marginal productivity.

(12) *The Sum of Factor Payments is not Equal to the Product*. Since each factor is paid according to its marginal product, it follows that sum of all payments to factors will equal the total product. In reality, the sum of the marginal products is greater than the total product. Thus, there is a surplus which is the result of cooperative working of the factors. If at any time an important factor-unit is withdrawn from the productive process, it will completely disorganise the entire business. The withdrawal of this factor-unit will diminish the total product by more than the marginal product of that unit. Thus the theory of marginal productivity does not provide a correct measure of the pricing of factor-services.

Conclusion. We may conclude that the marginal productivity theory is not an adequate explanation of the determination of the pricing of factor-services. It simply states the demand side of the factor pricing and, therefore, is one-sided. It is worked under the restricted assumptions of perfect competition and full employment of resources and is thus unrealistic. It is static and takes for given that the price of a factor-unit must equal to its marginal revenue productivity. Thus it fails to explain the determination of factor pricing in a dynamic economy.

This theory differs from the Ricardian theory in two respects: *Firstly*, in the Ricardian analysis the principle of substitution is employed only with regard to use of labour relative to land, while in the neo-classical theory this principle is assumed to hold good in the case of any factor in relation to any other.

Secondly, Ricardo employed this principle to show that a fixed factor will earn a surplus determined by the gap between the average and marginal product of the variable factor, the neo-classical theory, on the contrary, states that any variable factor, under competitive conditions, must obtain a reward equal to its marginal product.

5. KALECKI'S DEGREE OF MONOPOLY THEORY

Prof. Kalecki[10] has developed a theory of distribution based on Lerner's concept of the "degree of monopoly". The theory states that "the relative share of gross capi-

[10] M. Kalecki's article in *Econometrica*, April 1938. Subsequently revised *Essays in the Theory of Economic Fluctuations* (1939) pp. 13-41; *Studies in Economics Dynamics* (1943), Chapter I; and *Theory of Dynamic Economics* (1954), Chapters 1 & 2.

talist income and salaries in the aggregate turnover is with great approximation equal to the "average degree of monopoly"

Taking Lerner's microeconomic degree of monopoly measurement, Kalecki applies it to his macroeconomic model Lerner's degree of monopoly of a single firm is measured as

$$\mu = p - m/p \quad \ldots (1)$$

where μ is the degree of monopoly, p is price and m is the marginal cost.

Kalecki assumes the equality of marginal cost (m) and average cost (a). So by substituting a for m in the above equation we have

$$\mu = p - a/p \text{ or } p\mu = (p - a) \quad \ldots (2)$$

where $(p - a)$ is made up of profits, interest, depreciation and salaries. In other words, it represents gross capitalist income plus salaries per *unit* of *output* of the employer

To find out the *total gross* capitalist income of the employer, the total output of firm x is multiplied to both sides of equation (2). Thus we have

$$xp\mu = x\,(p - a) \quad \ldots (3)$$

where $x\,(p - a)$ is the total gross capitalist income of the employer of a *firm*.

To arrive at the gross capitalist income of *all the firms* in the economy, we multiply both sides of equation (3) by Σ (sigma which represents the aggregation or summation). Thus equation (3) becomes

$$\Sigma xp\mu = \Sigma x\,(p - a) \quad \ldots (4)$$

where the expression $\Sigma\,(p - a)$ is the gross capitalist income of all the firms in the economy, and Σxp is the total value of the output of all goods produced and sold in the economy. In other words, Σxp is the aggregate turnover of the economy which Kalecki designates as T. T consists of the gross national income *plus* the aggregate cost of marketable raw materials. Dividing both sides of equation (4) by T, we have

$$\frac{\Sigma xp\mu}{T} = \frac{\Sigma x(p - a)}{T}$$

or

$$\frac{\Sigma xp\mu}{\Sigma xp} = \frac{\Sigma x(p - a)}{T} \quad \ldots (5)\ (\because \Sigma xp = T)$$

The expression on the left-hand side of the above equation $\Sigma xp\mu/\Sigma p$ is the weighted average of the degree of monopoly μ which can be written as $\bar{\mu}$

Equation (5) can be written as

$$\bar{\mu} = \Sigma x\,(p - a)/T \quad \ldots (6)$$

which shows that the macro-degree of monopoly ($\bar{\mu}$) is equal to the ratio of gross capitalist income of the economy [$\Sigma x\,(p - a)$] over the aggregate turnover of the economy (T).

The degree of monopoly $\bar{\mu}$ on which this equation is based has been defined as the ratio of price of prime costs which is in fact the ratio of gross profits to wages. The above equation shows the *average* degree of monopoly cannot hold true in the case of free competition where $\bar{\mu}$ is equal to zero. In the case of monopoly, it is correct only when it is assumed: (*i*) that enterprises operate below the point of full capacity, and (*ii*) that the prime costs per unit of output are stable over the relevant range of output. The formula is thus realistic for no enterprise produces up to its full capacity as the demand curve (AR) touches the average cost curve to the left of

its minimum point under imperfect competition or monopoly. It is applicable both in the short and long run. Inventions and the elasticity of substitution between capital labour do not have any influence on the distribution of income, since the marginal cost curve coincides with the average cost curve. If, however, technical progress influences the degree of monopoly in an industry by affecting the size of enterprises, the distribution of income is influenced via the degree of monopoly.

Next Kalecki derives the equation for the relative share of wages in the gross national income. The expression $\Sigma x\ (p-a)$ is, in fact, the share of gross national income after the wage bill is paid. If national income is denoted by Y and the wage bill by W, then $Y-W$ also represents gross national income. Equation (6) can be written as

$$\bar{\mu} = Y - W/T \qquad \ldots (7)\ (\because \Sigma x\ (p-a) = Y - W)$$

Multiplying both sides by T/W in equation (7), we get

$$\bar{\mu} \,.\, T/W = (Y - W/T)\ T/W$$

or
$$\bar{\mu} \,.\, T/W = (Y - W)/W$$

or
$$\bar{\mu} \,.\, T/W = Y/W - 1$$

or
$$1 + \bar{\mu} \,.\, T/W = Y/W$$

To know the share of wages in national income (i.e., W/Y), we write the reciprocal of the above equation:

$$W/Y = \frac{1}{1 + \bar{\mu}.T/W} \qquad \ldots (8)$$

Equation (8) reveals that the share of wages in national income varies inversely with the degree of monopoly. Further, the share of wages also depends upon T/W. Thus, according to Kalecki, the relative share of wages in gross national income is determined by the degree of monopoly in the long-run, by the prices of raw materials in relation to wage unit cost, and industrial composition. A rise in the degree of monopoly reduces the relative share of wages in national income. A rise in prices of basic raw materials in relation to wages reduces the relative share of wages in national income but in a much lesser proportion. Thus the degree of monopoly and prices of raw materials pull in the opposite direction. The rise in the prices of raw materials in a boom is offset by a fall in the degree of monopoly; while fall in the prices of raw materials during a recession is offset by a rise in the degree of monopoly.

About industrial composition and the relation of raw material prices to unit wage costs, it is difficult to say with definiteness. But some specific observations can be made during the business cycle. Raw material prices fall during the slump in relation to wages and they tend to increase the relative share of wages in income, while changes in industrial composition affect the relative share of wages adversely during a depression, and vice versa. Thus raw material prices, the degree of monopoly and industrial composition act and react upon each other both in the short-run and the long-run thereby keeping the share of wages in national income as constant.

Its Criticisms

Kalecki's theory has its limitations.

1. *Degree of Monopoly not Properly Defined.* Kaldor has criticised the manner in which the degree of monopoly has been defined, i.e., as the ratio of price to prime costs. He observes that "propositions based on implicit definitions of this kind make of course no assertion about reality and possess no explanatory value."

2. *Prime Costs plus Mark-up Determine Prices.* The identification of the 'mark-up' (gross profit) with the degree of monopoly makes all firms using a large ratio of capital to labour as monopolists. This is not a correct view because it has been found empirically by Hall and Hitch that a number of oligopolistic firms determine prices by prime costs plus a 'mark-up'.

3. *Prime Costs not Constant.* The theory assumes that all firms have constant prime costs. But prime costs are not equal for all firms. As a result, the industry supply curve will have a positive slope despite the fact that prime costs of all firms are constant.

4. *Neglects the Influence of Trade Unions.* According to Phelps Brown and Hart[11], this theory neglects the influence of trade unions on income distribution. There are both 'hard' and 'soft' labour markets. In the 'hard markets' trade unions can raise wages by squeezing employers, whereas in the 'soft markets' they fail to squeeze employers because the latter are able to raise product prices. "The difficulty with this theory is that there are no measures of bargaining power which are independent of the result of bargaining." Thus the causes of changes in the share of labour may be different from that given by Kalecki.

5. *Not a Theory but an Explanation.* According to Professor Reder, it is not a theory but simply an explanation of the share of labour in national income. It discusses only some of the factors affecting the degree of monopoly power.

6. *Neglects the Role of Technical Progress.* Kalecki's assertion that 'neither inventions nor the elasticity of substitution has any influence on the distribution of income is not borne out by empirical evidence. By this assumption, he has only tried to deny the role of marginal productivity theory of distribution in determining the distribution of national income. But technical progress has always been an important factor in income distribution. It accounted for 1.8 per cent per year in the growth rate of the United States during 1929-57.

7. *Ignores many Factors.* Jan Pen[12] criticises Kalecki for the nature of the degree of monopoly. According to him, Kalecki regards the degree of monopoly as a structural characteristic determined by the degree of competition. But there are also other forces that influence profits, interest and wages. They are the existence of cost differentials between firms, the shortage of capital and the influence of trade unions. Kalecki ignores all these factors in his theory of distributive shares.

8. *Small Firms also Need Higher Profit Margins.* Jan Pen also criticises Kalecki for ascribing higher profit margin to large corporations. According to him, "In general it has not been proved that this is higher for large firms than for small ones. Small firms sometimes need a higher profit margin to stay in business."[13]

9. *Explains Little.* Jan Pen regards Kalecki's degree of monopoly as a tautology

[11] E.H. Phelps Brown and P.E. Hart, "The Share of Wages in National Income", *E.J.*, Vol. 62, 1952.
[12] Jan Pen, *Income Distribution*, 1971.
[13] *Ibid.*

where all factors that influence profit, interest, land rent, and salaries of employees meet in this variable. According to him, the degree of monopoly "is a kind of garbage can for casual factors, and thus explains little."

10. *Difficult to Aggregate Micro Degrees into Macro Degree.* As pointed out by one economist, "Kalecki too readily sweeps aside the difficulties of aggregating micro degrees of monopoly into a macro degree of monopoly."

Despite these criticisms, Kalecki's theory is realistic in pointing out the existence of monopoly rather than perfect competition in this world and the manner in which monopoly power tends to affect the distribution of income.

6. THE KEYNESIAN OR KALDOR'S THEORY OF DISTRIBUTION

Keynes never formulated a theory of distribution. The credit of developing the "Keynesian Theory of Distribution" goes to Prof. Kaldor who contends that the principle of the Multiplier could be used for the determination of the relation between prices and wages, given the level of output and employment. But Keynes applied it to the determination of the level of employment, keeping the relation between prices and wages (distribution) as given.

Professor N. Kaldor builds his theory on the following assumptions:

(1) There is "a state of full employment so that total output or income (Y) is given."

(2) National income or output consists of wages (W) and profits (P) only. W comprises both manual labour and salaries, while P includes the income of property owners and of entrepreneurs.

(3) The marginal propensity to consume of workers is greater than that of the capitalists whereby the marginal propensity to save of the workers is small in relation to those of capitalist.

(4) The investment-output ratio (I/Y) is an independent variable.

(5) Elements of imperfect competition or monopoly power exist..

Taking Sw as aggregate savings out of wages and Sp as aggregate savings out of profits, we have

$$Y \equiv W + P$$

But
$$I \equiv S$$

and
$$S \equiv Sw + Sp$$

Investment being given and assuming simple proportional savings function, $Sw = swW$ and $Sp = spP$, we obtain the equation

$$I = spP + swW = spP + sw(Y - P) \text{ since } W \text{ is equal to } Y - P$$
$$= spP + swY - swP$$
$$= (sp - sw)P + swY$$

When the ratio of investment to national income

$$\frac{I}{Y} = \frac{(sp - sw)P + swY}{Y}, \text{ or } \frac{I}{Y} = (sp - sw)\frac{P}{Y} + sw \quad \ldots(1)$$

and from (1) the ratio of profit to national income, P/Y can be derived as under

$$(sp - sw)\,P/Y = I/Y - sw$$

or
$$P/Y = \frac{1}{sp - sw} \times I/Y - \frac{sw}{sp - sw} \quad \ldots(2)$$

Thus, given the marginal propensities to save the wage-earners and the capitalists, the share of profit in national income depends on the ratio of investment to the total output. If there is an increase in investment-income ratio I/Y, it will result in an increase in the share of profits to national income P/Y, so long as $sp > sw$. This is illustrated in Figure 35.5.

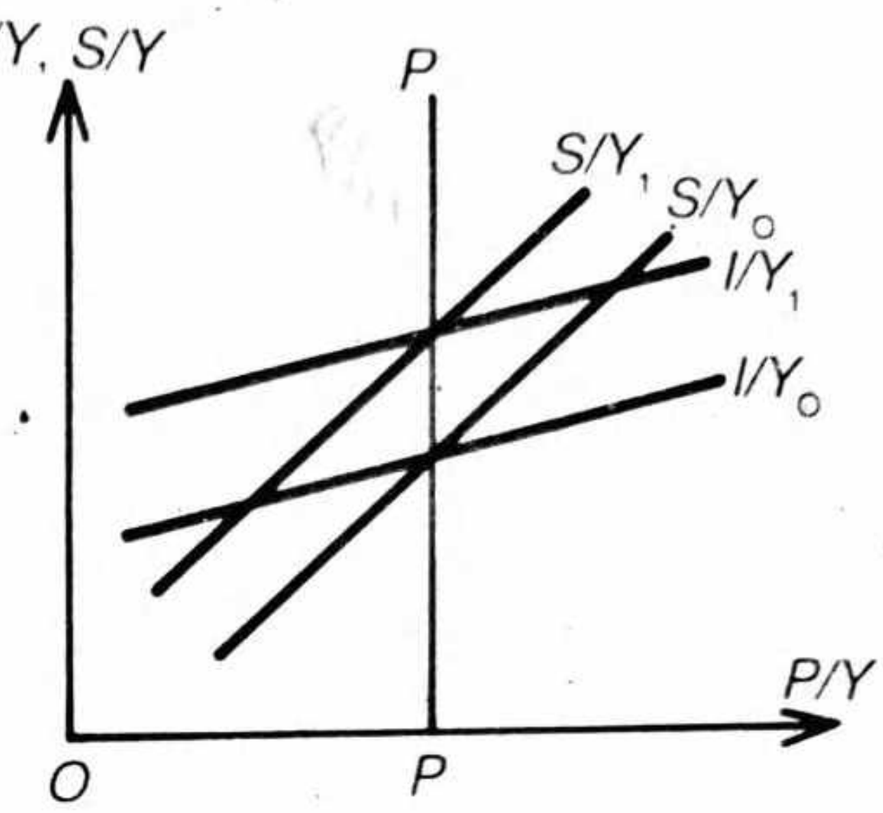

FIG. 35.5

Given the full employment level of income Y_0, the saving-income ratio and the investment-income ratio are S/Y_0 and I/Y_0 respectively. The economy is in equilibrium with a fixed profit-income ratio given by the vertical line PP. If there is an increase in income, the S/Y_0 and I/Y_0 functions shift upward to S/Y_1 and I/Y_1. But the share of profits in national income remains constant as given by the line PP. In case I/Y alone shifts up, the saving-income function remaining at S/Y_0 level, there would be inflationary rise of prices. This would raise the profit-income ratio and thus push up the saving-income function to S/Y_1. If such a relation continues between the investment income and saving-income functions, the economy will maintain itself as the full employment level and the share of profit in income will remain constant.

The interpretative value of this model, according to Kaldor, depends on treating investment, or rather the ratio of investment to output I/Y, as an independent variable, invariant with respect to changes in sp and sw. This, along with the assumption of full employment, shows that the level of prices in relation to the level of money wages is determined by demand. An increase in the level of investment would raise the level of demand and prices, money wages remaining constant. Consequently, the share of profit in national income would rise but decrease the share of wages. Contrariwise, a fall in investment will reduce total demand, bring a fall in prices and profit margins, but increase the share of wages. "Assuming flexible price (or rather flexible profit margins) the system is thus stable at full employment."

As already pointed out, this model operates when the two savings propensities differ, $sp \neq sw$. $sp > sw$ is the stability condition. If sp is less than sw, a fall in prices would cause a fall in demand and to a cumulative fall in prices. Similarly, a rise in price would be cumulative.

Further, "the degree of stability" of the system is dependent upon the difference between the marginal propensities to save, on $1/(sp - sw)$ which Kaldor defines as the 'coefficient of sensitivity of income distribution.' If there is a small difference between the two marginal propensities (sp and sw), the coefficient $(1/sp–sw)$ will be large and small changes in the investment-output ratio (I/Y) will lead to relatively large changes in income distribution (P/Y), and vice versa. In case the marginal propensity to save from wages is zero ($sw = 0$), the amount of

profits is equal to the sum of investment and capitalist consumption, i.e., $P = \frac{1}{sp} I$.

This is "widow's cruse" where a rise in the consumption of entrepreneurs raises their total profit by an exactly equal amount. In this 'special case' (where $sw = 0$) "wages are a residue profits being governed by the propensity to invest and capitalists' propensity to consume, which represent a kind of 'prior charge' on the national output." If I/Y and sp are assumed to be constant over time, the share of wages will also remain *constant*. In other words, as output per man increases, real wages will rise automatically year by year. In case the propensity to save out of wages (sw) is *positive*, total profits will fall by the amount of workers' savings (Sw). When the workers' savings are reduced, total profits rise by a greater amount than the change in investment, and the share of income going to workers will decline. On the other hand, when the workers' savings increase, total profits fall by a greater amount than the change in investment and there is a rise in the share of income going to workers.

However, in the short-run, the shares of profits and wages tend to be constant due to the downturn inflexibility of the profit-income ratio and the real wage rate as a consequence of the constancy of the investment income ratio (I/Y). But a rise in the investment-income ratio leads to a fall in the share of wages and of a rise in the share of profits in national income.

Its Criticisms

Kaldor's theory of income distribution has been severely criticised on the following grounds:

1. *I/Y dependent upon P/Y.* Kaldor assumes that the share of profits and wages are dependent upon the investment-income ratio I/Y. But this assumption is itself true under certain conditions, according to Kaldor. *First*, the real wage rate cannot fall below a minimum subsistence rate. *Second*, the share of profit cannot fall below "the risk premium rate" which is the minimum profit rate necessary for inducing capitalists to invest. *Third*, the share of profit cannot be below the "degree of monopoly rate", i.e., minimum rate of turnover due to imperfect competition, collusive agreements, etc. The second and third being alternative limitations, the higher of the two will apply. *Fourth*, the capital-output ratio should be independent of the rate of profit. If these conditions are not satisfied, investment-income ratio (I/Y) will itself be dependent upon the rate of profit (P/Y).

2. *Unrealistic Assumption of Full Employment.* Kaldor has based his theory on the assumption of full employment. This is unrealistic because the theory fails to explain the functional distribution of income below the level of full employment. In this context, Peterson opines that "Kaldor's analysis has a distinct classical flavoar, even though his framework is that of modern employment theory."

3. *Weak Theory.* Jan Pen has argued that when the investment-income ratio I/Y increases, the entrepreneurs become optimist because the share of profits increases. Given sw and sp, the entrepreneurs reinvest their profits. As a result, I/Y increases further, and so do profits. In this way, there may be an infinite expansion of the economy. But this is not possible in actuality. Rather, a continuing rise of the investment-income ratio I/Y is likely to lead to overspending, wage inflation, and a

wage-price spiral which in fact determine income distribution. The Kaldorian theory is weak in that it does not discuss these consequences of an increase in I/Y.[14]

4. *Workers' Savings do not go to Capitalists*. Another weakness of the Kaldor theory is that it attributes all profits to the capitalists and in this way it implies that workers' savings are totally transferred as a gift to the capitalists. This is clearly absurd, for under such a condition no individual would save at all.

5. *Neglects Technical Progress*. The Kaldor theory neglects the impact of technical progress on income distribution. Even assuming that workers do not save out of wages ($sw = 0$), it is not possible to raise the total profits of entrepreneurs by an exactly equal amount through 'Widow's Cruse'. It is, in fact, technical progress which helps in increasing profits.

6. *Neglects Rent and Interest*. The Kaldorian theory is weak in that it neglects the relative shares of land and capital in the form of rent and interest.

7. *Demand determines Relative Shares and not Prices*. Prices are so taken in Kaldor's theory that they cover costs and yield a uniform rate of profit. But the rate of profit cannot be known without determining the profit share. Relative shares are, therefore, determined by demand on the part of labour. If wages are given, prices are determined by a uniform rate of profit. Thus the forces of demand determine relative shares rather than prices.

8. *Neglects the Role of Human Capital*. Kaldor's theory of distribution is unrealistic because it does not take into consideration human capital which plays an important role in determining distributive shares in national income. The theory states that with the rise in I/Y, the share of profit in national income increases but the share of wages falls. As a result of the decline in the share of labour, the condition of the wage earners will deteriorate. This will, in turn, reduce the economy's real income and output. Thus, in the words of McCormik, "the failure of the theory to incorporate human capital leaves the theory too simple to explain the complexities of the real world."[15]

To conclude with Jan Pen, the Kaldorian theory of income distribution "is highly misleading. The algebra is in order, but the structure of the reasoning is false."

7. THE SRAFFA MODEL

Sraffa in his book *Production of Commodities by Means of Commodities* (1960) analyses prices of production. Sraffa demonstrates that when commodities are produced by separate industries in a system of subsistence production, relative prices are determined on the basis of the conditions of production alone.

The Assumptions

Sraffa's analysis is in terms of a Ricardian long-run equilibrium system based on the following assumptions: (1) Labour is homogeneous and the only primary non-reproducible input in the system. (2) Fixed input-coefficients prevail in all industries. (3) Production of commodities obeys the conditions of constant returns to scale. (4) Every industry produces a single commodity by a single technique. A

[14] Jan Pen, *op. cit.*
[15] B.J. McCormik, *Wages*, 1969.

UNIT - II

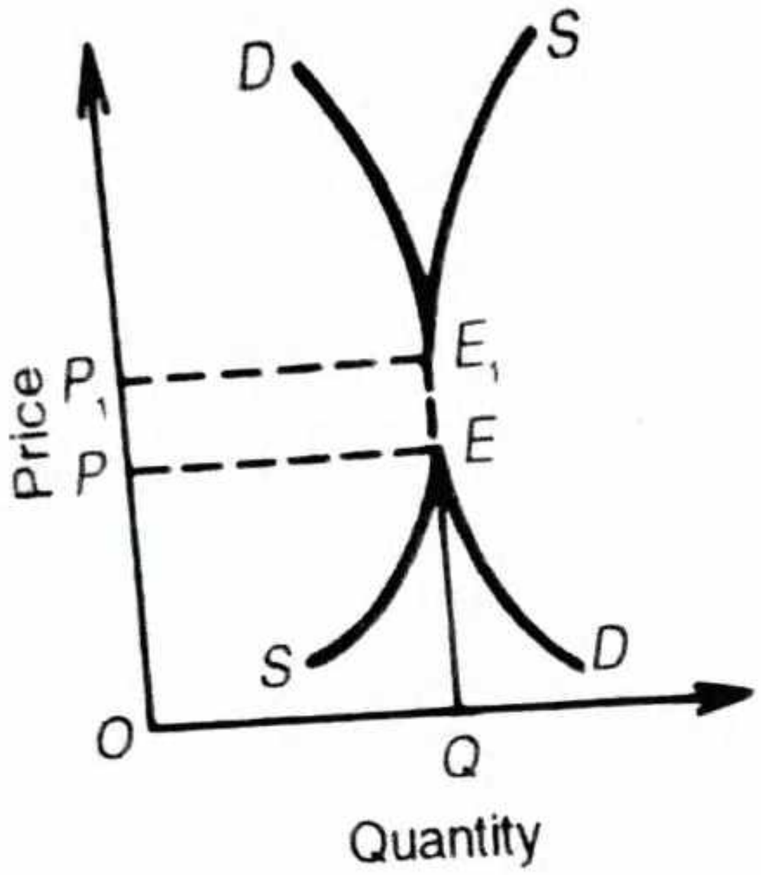

FIG. 6.3

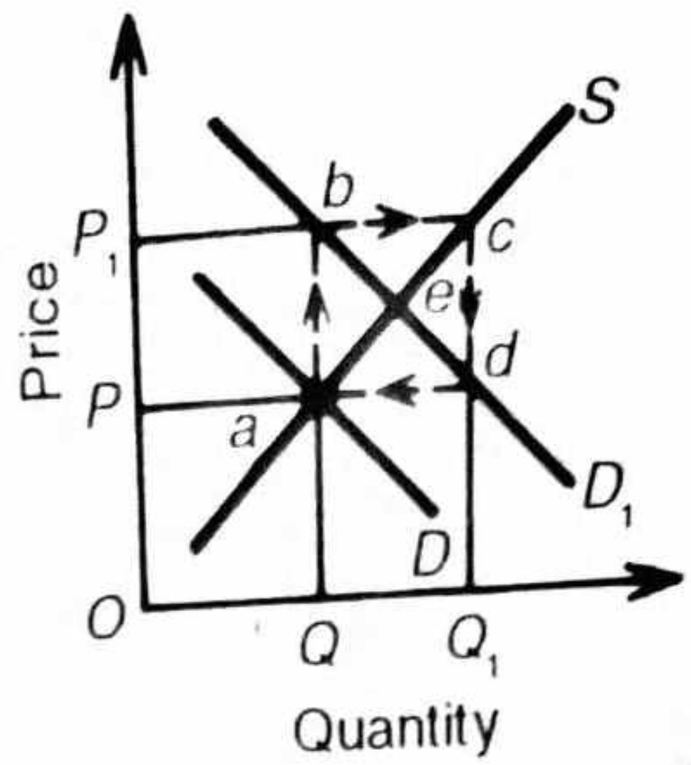

FIG. 6.4

equilibrium.

In case the market is dynamic, an increase in demand leads to a rise in the price to OP_1 (= Qb) which induces the producers to increase the supply to OQ_1 in Figure 6.4. But the demand price Q_1d being less than the supply price Q_1c, the producer tends to reduce the supply to OQ. But the demand is more than the supply at this level; price will, therefore, again rise to Qb (= OP_1). In this way, the prices and quantities will move in a circle with oscillations of constant amplitude around the equilibrium point e.

It may be noted here that of the three equilibria—stable, unstable and neutral—it is only the stable equilibrium which is of use to economists for analysing complex economic problems. The unstable and neutral equilibrium are, however, of academic interest only.

6. PARTIAL EQUILIBRIUM

Partial or particular equilibrium analysis, also known as microeconomic analysis, is the study of the equilibrium position of an individual, a firm, an industry or a group of industries, viewed in isolation. It is a market process for the determination of product prices and factor prices in which one or two variables are discussed, other things remaining equal (*ceteris paribus*). In the words of Prof. Stigler: "A partial equilibrium is one which is based on only a restricted range of data, a standard example is price of a single product, the prices of all other products being held fixed during the analysis." The Marshallian economics is mostly a study in partial equilibrium analysis.

Partial equilibrium analysis is concerned with two types of economic problems. *First*, those pertaining to only particular aspects of the economic behaviour of a certain individual, firm or industry. For instance, it may limit itself to the market for a single product where its price, the technique of production, and the amount of factors used in its production are taken into consideration, while all other factors affecting it are assumed to be constant. *Second*, it studies only the

first-order consequences of the economic events its analyses. It ignores the effects on the prices of other commodities brought about by the product being analyzed and in turn secondary influences of the former on the product.

We may briefly study the equilibrium conditions of an individual, a firm, an industry and a factor.[7]

A consumer is in equilibrium when he spends his money income on the different goods and services in such a way that he gets the maximum satisfaction. The conditions are: (1) the marginal utility of each good is equal to its price (P), *i.e.*, $\frac{MU_A}{P_A} = \frac{MU_B}{P_B} = \cdots = \frac{MU_N}{P_N}$; and (2) the consumer must spend his entire income (Y) on the purchase of goods, *i.e.*, $Y = P_AQ_A + P_BQ_B + \ldots\ldots + P_NQ_N$. It is assumed that his tastes and preferences, money income and the prices of the goods he wants to buy are given and constant.

A firm is in equilibrium when it has no tendency to change its output. In the short run, it equalizes its marginal revenue with marginal cost and in the long run it satisfies the conditions of full equilibrium, $MC = MR = LAC$ as its minimum. Thus, it earns only normal profits and has no tendency to leave the industry. In the analysis of the firm, the given data are the techniques of production, the prices of its products and of the factors.

An industry is in equilibrium when all its firms are earning normal profits and there is no tendency for the existing firms to leave or for new firms to enter it. In the market for a single product only one price rules at a time, at which the quantity which the consumers wish to buy exactly equals the quantity being produced by the different firms. Each firm in the industry sells its product at the ruling market price and produces that level of output where its marginal cost equals marginal revenue. In the short run, it can produce even at a price less than its average costs of production, but in the long run the price must equal its minimum average costs of production.

A factor of production (land, labour, capital or organization) is in equilibrium when it is employed in its highest paid employment so that its income is maximized. It is a position where its price equals its marginal revenue product. At this price, it has no incentive to offer more or less of its service and not to seek employment elsewhere. Thus, there is one price for the factor which rules throughout the market at any time. Moreover, the quantity of the factor which its owners are willing to sell at the ruling price must equal the quantity which the entrepreneurs are willing to hire.

Assumptions

This partial equilibrium analysis of the market assumes that the price of the product is given and constant for consumers. Their incomes, tastes, habits and preferences also remain constant. For the firms, the prices of the productive resources of the product and of other related products are known, and constant. Factors of production are easily available to the industry at known and constant prices in accordance with the techniques of production in use. If there is any change,

[7] These can be explained diagrammatically after reading Chapters 8, 22 and 37 respectively.

say in consumers' tastes or techniques of production, the producer-consumer p... are revised and equilibrium is re-established, though at a new level.

The analysis of the market for a factor assumes that the prices of the prod... which the factor helps in producing are known and constant and the prices ... quantities of all other factors are also given and constant. Moreover, factor ... production are perfectly mobile between occupations and places. In the short r... a factor may be earning less than its marginal revenue product, but in the long ... its price must equal the marginal revenue product at all places and in all empl... ments.

The analysis discussed above relates to a perfectly competitive market wh... can also be extended to monopoly, monopolistic competition, oligopoly, a... monopsony markets.

Its Merits

Partial equilibrium analysis possesses certain advantages. *Firstly*, it helps us analysing the causes of a change in the price of a product or service. Similarly th... cause of a change in the behaviour of an individual, a firm or an industry can als... be understood. *Secondly*, this method helps in predicting the consequences ... changes in the behaviour and plans of the market participants. The consequence... of interferences by the state in the working of the market system can also be ana... lyzed. For example, what are the effects of an excise duty on the prices, outpu... sales, and profits etc. on cotton textiles fall within the ambit of the partial equilib... rium analysis. *Thirdly*, it is an indispensable tool of analysis for the solution o... practical problems. By concentrating on a limited and narrow range of economi... subjects and by reducing the field of enquiry to one or two variables, it makes th... economic problems simple and intelligible. *Finally*, for an understanding of the general working of the economic system which involves the interdependence o... economic variables, partial equilibrium analysis acts as a stepping stone. Withou... it, we cannot understand and analyse general equilibrium analysis.

Limitations

But partial equilibrium analysis has its limitations. It is confined to one par... ticular field, may it be an individual, a firm or an industry. If unrealistic assump... tions which separate the study of a specific market from the rest of the economy are dropped, partial equilibrium analysis breaks down. The consequences of an economic disturbance in the market generate the forces of equilibrium which take the form of supply and demand changes moving from one market to another and thus initiating second, third and higher order waves of change in the entire economy. Partial equilibrium analysis is incompetent to study the interrelations of all parts of the economy. For an understanding of the interdependence of the economic process as a whole, the study of general equilibrium analysis is indispensable.

7. GENERAL EQUILIBRIUM*

General equilibrium analysis is an extensive study of a number of economic vari-

*For the theory of General Equilibrium, refer to Ch. 42.

ables, their interrelations and interdependences, for understanding the working of the economic system as a whole. It brings together the cause and effect sequences of changes in prices and quantities of commodities and services in relation to the entire economy. An economy can be in general equilibrium only if all consumers, all firms, all industries and all factor-services are in equilibrium *simultaneously* and they are interlinked through commodity and factor prices. As Stigler has said: "The theory of General Equilibrium is the theory of interrelationship among all parts of the economy." Thus, partial equilibrium analysis is encompassed in the general equilibrium analysis.

General equilibrium exists when all prices are in equilibrium; each consumer spends his given income in a manner that yields him the maximum satisfaction; all firms in each industry are in equilibrium at all prices and outputs; and the supply and demand for productive resources are equal at equilibrium prices.

Its Assumptions

The general equilibrium analysis is based on the following assumptions:

(1) There is perfect competition both in the commodity and factor markets.

(2) Tastes and habits of consumers are given and constant.

(3) Incomes of consumers are given and constant.

(4) Factors of production are perfectly mobile between different occupations and places.

(5) There are constant returns to scale.

(6) All firms operate under identical cost conditions.

(7) All units of a productive service are homogeneous.

(8) There are no changes in the techniques of production.

(9) There is full employment of labour and other resources.

Working of the General Equilibrium System

Given these assumptions the economy is in a state of general equilibrium when the demand for every commodity and service is equal to the supply for it. It implies perfect harmony of the decisions made by all the market participants. The decisions of consumers for the purchase of each commodity must be in perfect accord with the decisions of producers for the production and sale of each commodity. Similarly, the decisions of owners for selling each factor service must be in perfect harmony with the decisions of their employers. It is only when the decisions of buyers of goods and services fit in perfectly with the decisions of sellers that the market is in general equilibrium.

Given the tastes, preferences and aims of the consumers in the economy, the quantity of each commodity demanded depends not only on its own price but also on the price of each other commodity available in the market. Thus, each consumer maximizes his satisfaction relative to the prices ruling the market. For him, the marginal utility of each commodity equals its price.

Each consumer is assumed to spend his entire income on consumption, so his expenditure equals his income. His income, in turn, depends on the prices at which he is selling his productive services. In other words, a consumer earns by selling the productive services he owns. Thus, the demand of consumers for the various commodities depends upon their prices and the prices of services.

Let us take the supply side. Given the market structure, the state of technology and the aims of firms, the price at which a commodity sells depends on its costs of production. The costs of production, in turn, depend on the quantities of the various productive services employed and the prices paid for them. Assuming con-

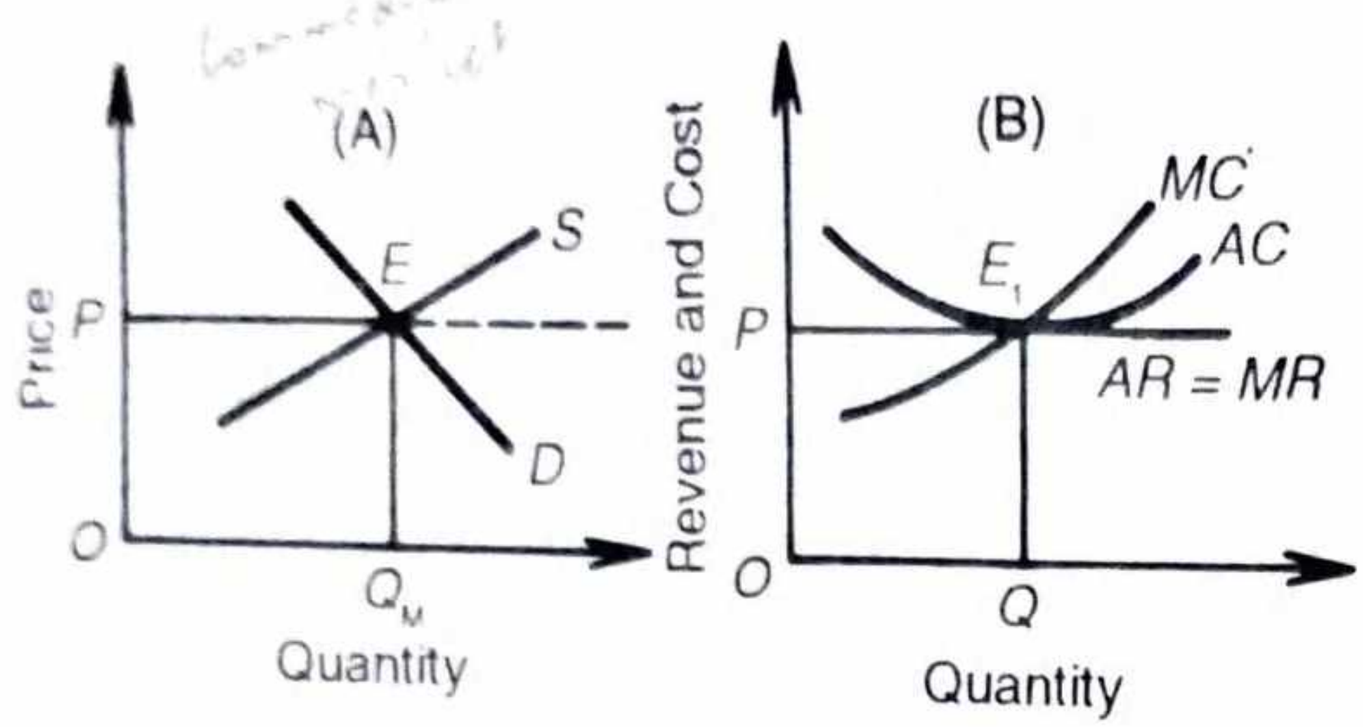

FIG. 6.5

stant returns to scale and identical cost conditions for all firms, each producer will produce and sell that quantity of output at which the demand price for the commodity equals both the minimum average cost and the marginal cost. The equilibrium of the commodity market is illustrated in Figure 6.5 (A). The market is in equilibrium at point E where the market demand and supply curves D and S intersect. It determines OP price at which OQ_M quantity of the product is bought and sold in the market. There being identical cost conditions, each firm in the market produces and sells the commodity at the given price OP. It is in equilibrium when $MC = MR$ and $AC = AR$ at point E_1 producing OQ units of the commodity, as shown in Panel B. If, say, there are 100 firms in the market each producing 60 units of the commodity, the total production will be 6000 ($= 100 \times 60$) units. This analysis *inter alia* can be extended to all commodities being produced in the economy.

Like the equality of demand and supply of commodities, the equality of demand and supply of factor services is also essential for the general equilibrium system. The demand for productive services comes from the producers and supply from the consumers. Given the state of technology and the profit maximisation objective of the producers, the quantity of a factor used in producing a commodity depends on the relationship between the prices of that factor and of all other factors and on the prices of commodities. Each producer maximises his profits relative to the ruling factor prices by employing the various factors in such proportions and quantities that their marginal revenue productivities are equal to their prices. Since there is full employment in the economy, the markets for factor are in equilibrium when the total quantities of factors offered and the total quantities employed are equal.

The equilibrium of the factor market is illustrated in Figure 6.6 where in Panel (A), the price of a factor OP and its quantity ON are determined in the market by

the interaction of its demand and supply curves D and S respectively at point E. Panel (B) shows that the supply curve of this factor to an individual firm is perfectly elastic and is the same as the marginal cost of that factor, MFC. The firm

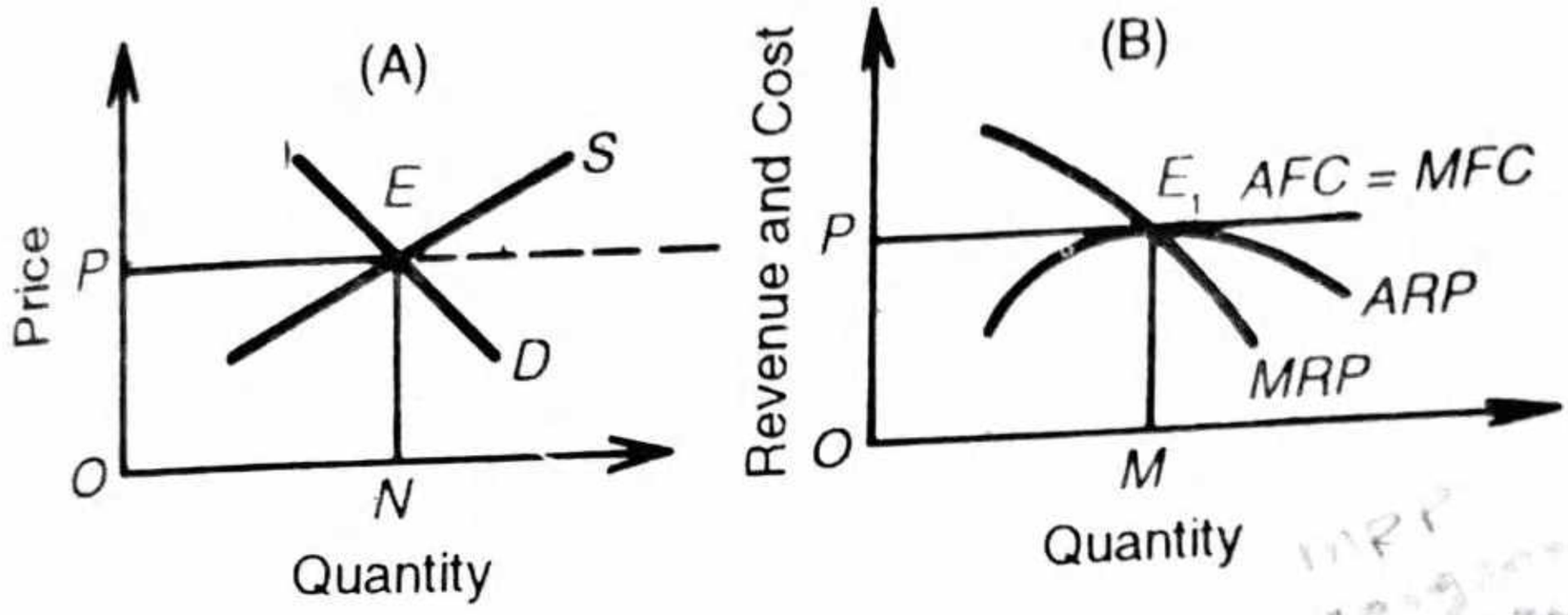

FIG 6.6

will employ units of the factor at the given factor price OP where $MFC = MRP$ and $AFC = ARP$ to the firm. Such an equilibrium point is E_1 at which it employs OM units of the factor. If there are 10 identical cost firms and each employs 100 units of the factor, the total market demand and supply of this factor will be 1000 units in the market. This analysis can be extended to the economy as a whole.

Thus the economy is in general equilibrium when commodity prices make each demand equal to its supply and factor prices make the demand for each factor equal to its supply so that all product markets and factor markets are simultaneously in equilibrium. Such a general equilibrium is characterised by *two* conditions in which the set of prices in all product and factor markets is such that (1) all consumers maximise their satisfactions and all producers maximise their profits; and (2) all markets are cleared which means that the total amount demanded equals the total amount supplied at a positive price in both the product and factor markets. To explain it, we begin with a simple hypothetical economy where there are only two sectors, the household and the business. The economic activity takes the form of flow of

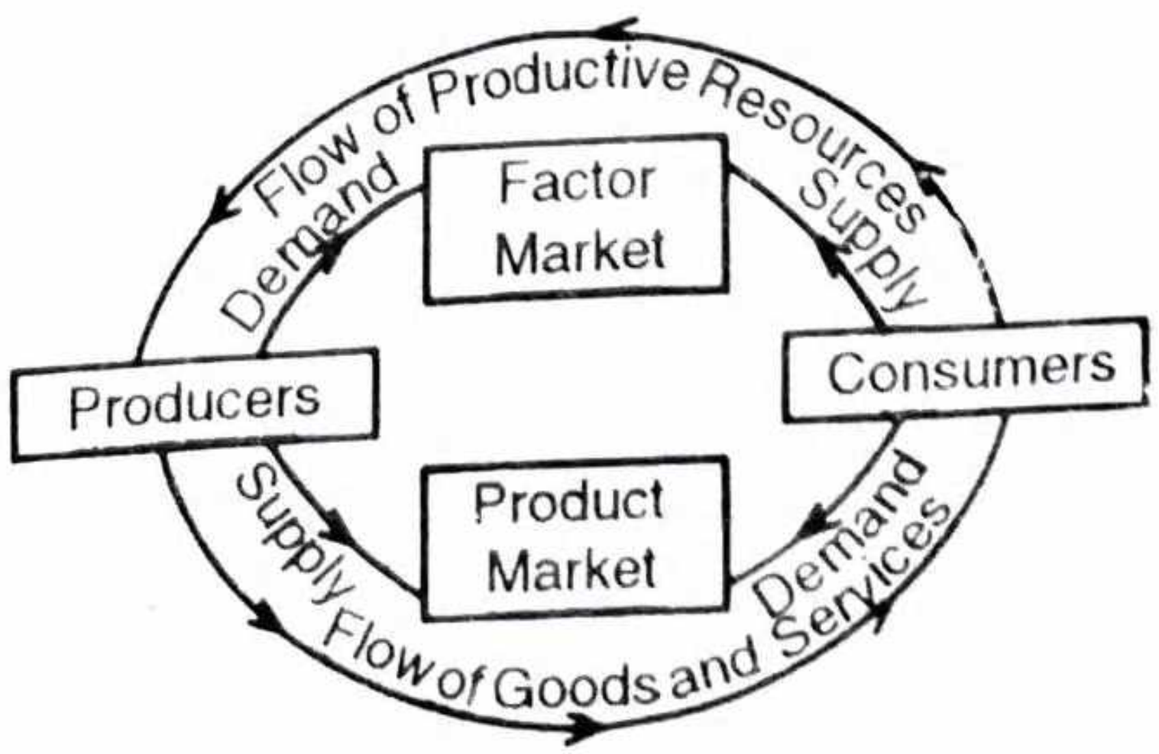

FIG. 6.7

goods and services between these two sectors and monetary flow between the
These two flows which are called real and monetary, are shown in Figure 6.7 wh
the product market is shown in the lower portion and the factor market in the upp
portion. In the product market, consumers purchase goods and services from pro
ducers while in the factor market, consumers receive income from the former
providing services. Thus consumers purchase all goods and services provided
producers and make payments to the latter in lieu of these. The producers, in t
make payments to consumers for the services rendered by the latter to the p
mely—wage payments for labour services, interest for capital supplied, etc.
payments go around in a circular manner from producers to consumers and c
consumers to producers, as shown by arrows in the outer portion of the figu
There are also flows of goods and services in the opposite direction to the mo
payments flows. Goods flow from the business sector to the household secto
the product market, and services flow from the household sector to the busine
sector in the factor market, as shown in the inner portion of the figure. These
flows are linked by product prices and factor prices. The economy is in gener
equilibrium when a set of prices is allowed at which the magnitude of income
from producers to consumers is equal to the magnitude of the money expendi
from consumers to producers.

Its Limitations

The general equilibrium analysis of the economy has several limitations.

Firstly, it is based on a number of unrealistic assumptions which are contrar
actual conditions prevailing in the world. Perfect competition, the very basis
this analysis, is a myth.

Secondly, it is a static analysis. All consumers and producers in this anal
consume and produce the same products day in and day out without any time-
Their tastes, preferences and aims are the same, and their economic decisions
in perfect harmony with each other. In reality, nothing of this sort happens.
ducers are consumers never act and think alike. Changes are taking place cont
stantly in tastes and preferences. There are no constant returns to scale and no
factor services are homogeneous. Thus cost conditions differ from produce
producer hence the given conditions are continuously changing, the mover
towards general equilibrium is ever thwarted and its attainment has ever remai
a wishful ideal.

Lastly, Prof. Stigler regards general equilibrium as a misnomer. According
him, "No economic analysis has ever been general in the sense that it conside
equilibrium studies as more inclusive than partial equilibrium studies, never th
less are complete. Moreover, the more general the analysis, the less specific
content must necessarily be."

Uses of General Equilibrium Analysis

The general equilibrium analysis possesses some important uses also.

A Picture of Economy Equilibrium. It presents a picture of a private enterpri
economy in equilibrium where consumers are attuned to a position of maximu
satisfaction and the producers to that of maximum profits. There is no wastage
resources. All are fully employed. Economic efficiency is at its maximum so tha

economic welfare of the community is maximised. Thus it helps in understanding the determinants of the pattern of an economy.

To Understand the Working of Economic System. Even otherwise, the theory is a schematic point of departure from which, by removing certain unwarranted assumptions, the actual working of an economic system can be understood. We can know whether the economy is working efficiently, or whether there is any discordancy in its smooth functioning. The problems of disequilibrium and the restoration of equilibrium can be studied with the help of this analysis.

To Understand the Complex Problems of the Market. The general equilibrium analysis further helps in predicting the consequences of an autonomous economic event. Suppose the demand for commodity *A* rises which may lead to a rise in its price. This, in turn, reduces the prices of its substitutes and raises the prices of complements. These may thus reduce the demand for *A* somewhat. The demand for *A* may be further affected if the prices of productive services also tend to rise. Thus the general equilibrium analysis aids in understanding the nature of the complex chains of relationships of the market on a step-by-step basis.

To Understand the Working of the Pricing Process. The general equilibrium analysis is also useful in explaining the functions of prices in an economy. As relative prices change three main decisions are made for the entire economy: what to produce and how much to produce, how to produce, and who will buy them when the commodities are produced. These decisions are made by individual producers and consumers because each commodity and service they want to produce, sell and buy, has a price that reacts to changes in their demand and supply. The general equilibrium analysis helps in integrating a variety of individual decisions affected by price changes.

To Understand the Input-Output Analysis. The main importance of general equilibrium analysis lies in its providing the conceptual basis for the input-output analysis developed by Leontief. In this analysis which is regarded an outstanding variant of the general equilibrium analysis, the household and industries are related in an invisible interdependent system of inputs and outputs of the economy. This analysis is being increasingly used for planning the economic development of backward regions and countries.

Basis of Modern Monetary and Welfare Economics. In recent years, general equilibrium analysis has been extended to monetary theory and welfare economics thereby making them more realistic fields of economic study.

EXERCISES

1. Distinguish between static and dynamic equilibrium. Explain your answer with the help of diagrams and equations.
2. Define dynamic equilibrium. Prove with suitable diagrams that equilibrium is actually achieved from time to time.
3. Define equilibrium and show with the help of the Cobweb theorem that under given conditions equilibrium can actually be achieved in practice.
4. "The concept of equilibrium is an indispensable tool in modern economic analysis." Discuss.
5. Find out the difference between Partial and General equilibrium analysis and explain in detail the general equilibrium analysis.

PART SIX

WELFARE ECONOMICS

Chapter 42

General Equilibrium Theory

1. INTRODUCTION

This chapter studies the Walrasian theory of general equilibrium, the graphic 2×2 general equilibrium model, and the problems of existence, stability and uniqueness of general equilibrium. The notions of partial equilibrium, general equilibrium and other related concepts of equilibrium have already been discussed in the chapter on 'The Concept of Equilibrium' in Part One above.

2. PROBLEMS OF EXISTENCE, STABILITY AND UNIQUENESS OF GENERAL EQUILIBRIUM

The problems of existence, stability and uniqueness are involved in the general equilibrium analysis. They are discussed below in terms of the demand and supply curves of the partial equilibrium analysis and their results can be extended to the general equilibrium analysis.

1. Existence of General Equilibrium

The problem of existence of general equilibrium is related to the behaviour of buyers and sellers in the market and how it influences their demand and supply curves. An equilibrium is said to exist when the demand and supply curves equal at a *positive price*. Such a price is called the *equilibrium price*. The quantity demanded and supplied at that price is called the *equilibrium quantity*. There is neither excess demand nor excess supply at the equilibrium price. The excess demand is zero at this price. Symbolically,

$$E_D = Q_D - Q_S = 0$$

where E_D is excess demand, Q_D is the quantity demanded and Q_S is the quantity supplied.

Excess demand is the point where the demand curve cuts the supply curve at a certain price. For the existence of equilibrium the two curves should intersect each other at a positive price.

There are two conditions for the existence of general equilibrium at a positive price:

1. All consumers maximise their satisfactions and all producers maximise their profits at that price.

2. All markets are cleared at that price, that is, the total amount demanded equals the total amount supplied in both the commodity and factor markets at a positive price.

Figure 42.1 illustrates the existence of general equilibrium when the demand curve intersects the supply curve s at point E and OP price is determined which is the positive price. It clears the market at OQ quantity demanded and supplied. This figure may be presumed to apply to the commodity market as well as the factor market.

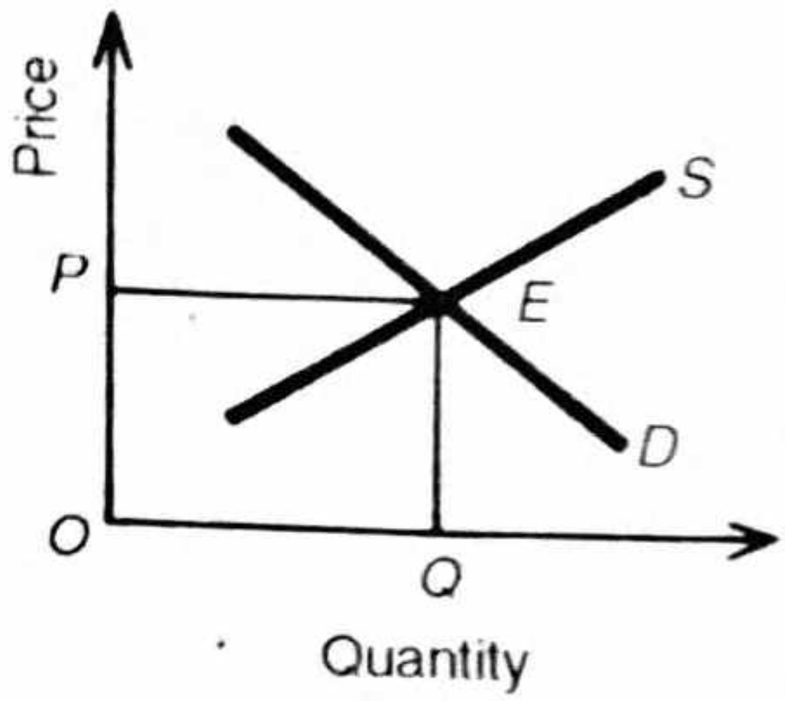

FIG. 42.1

According to Arrow and Debreu[1], when there are no discontinuities and non-increasing returns to scale in perfectly competitive markets, there is the existence of general equilibrium.

2. Stability of General Equilibrium

There is stability of general equilibrium when the equality between demand and supply is disturbed at a given price, and excess demand or excess supply forces the price and, therefore, the quantity demanded and supplied to the equilibrium price and quantity. Geometrically, the equilibrium is stable when the demand curve intersects the supply curve from *above*. The stability of equilibrium is illustrated in Figure 42.2 where the demand curve D cuts the supply curve S from above at point E which is the *equilibrium point*. OP is the *equilibrium price* at which OQ *equilibrium quantity* is bought and sold. If the price falls from OP to OP_2, demand $P_2d_1 > P_2s_1$ supply and s_1d_1 represents *excess* demand. Since the demand is greater than the supply, competition among buyers will raise the price from OP_2 to the equilibrium price OP. If the price rises from OP to OP_1, the supply $P_1s > P_1d$ the demand which leads to an *excess* supply of ds quantity in the market. Since the demand is less than the supply, every seller will try to sell his quantity of the commodity first by lowering the price a little. Ultimately, competition among sellers will bring down the price from OP_1 to the equilibrium price OP. In this way, point E at OP price depicts stability of the equilibrium.

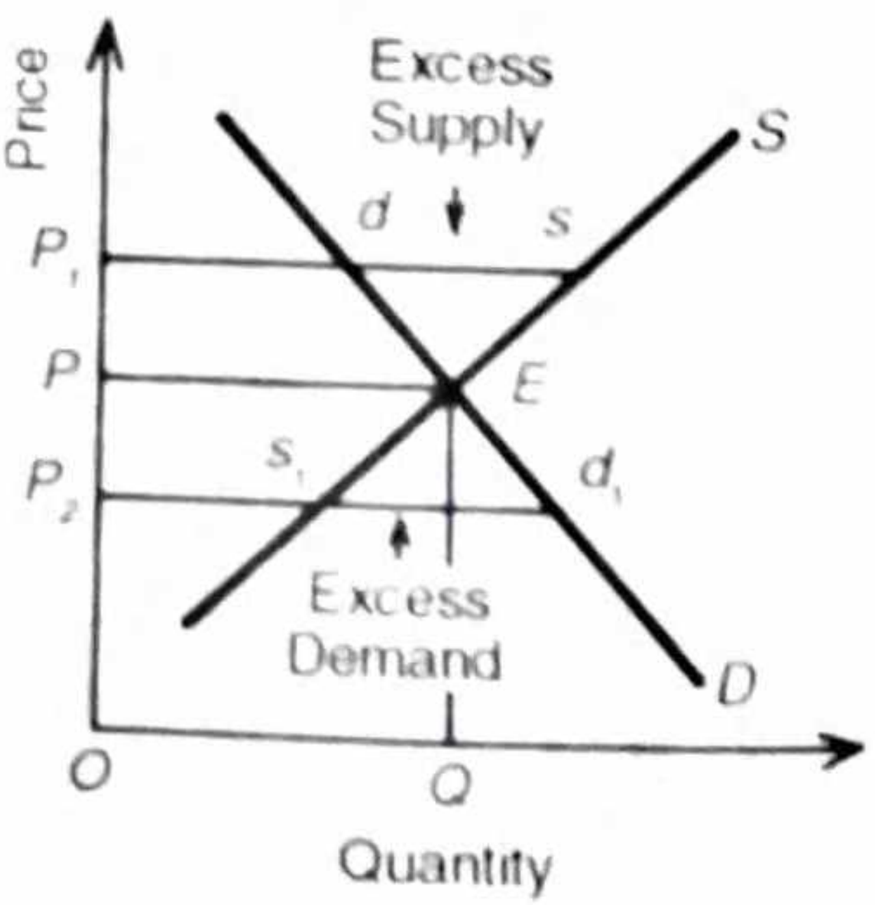

FIG. 42.2

On the other hand, *unstable equilibrium* is a situation in which once the equilibrium price is disturbed, it can never be reestablished. Geometrically, when the demand curve cuts the supply curve from *below*, the equilibrium is unstable. This is explained in Figure 42.3 where the demand curve D is upward sloping and cuts

[1] K.J. Arrow and G. Debreu, "Existence of an Equilibrium for a Competitive Economy", *Econometrica*, Vol. 22, 1954.

the supply curve S from below at point E which determines the equilibrium price OP. If the price rises to OP_1, the quantity demanded $P_1d > P_1s$ the quantity supplied. When the demand is more than the supply, price will be pushed further upwards, and the rise in price will not eliminate excess demand. It will only aggrevate the problem because the equilibrium position E will never be attained. Similarly, there is instability in the downward direction. When the price falls to OP_2, there is excess supply by d_1s_1 which further brings down the price and there is no possibility of attaining the equilibrium position E.

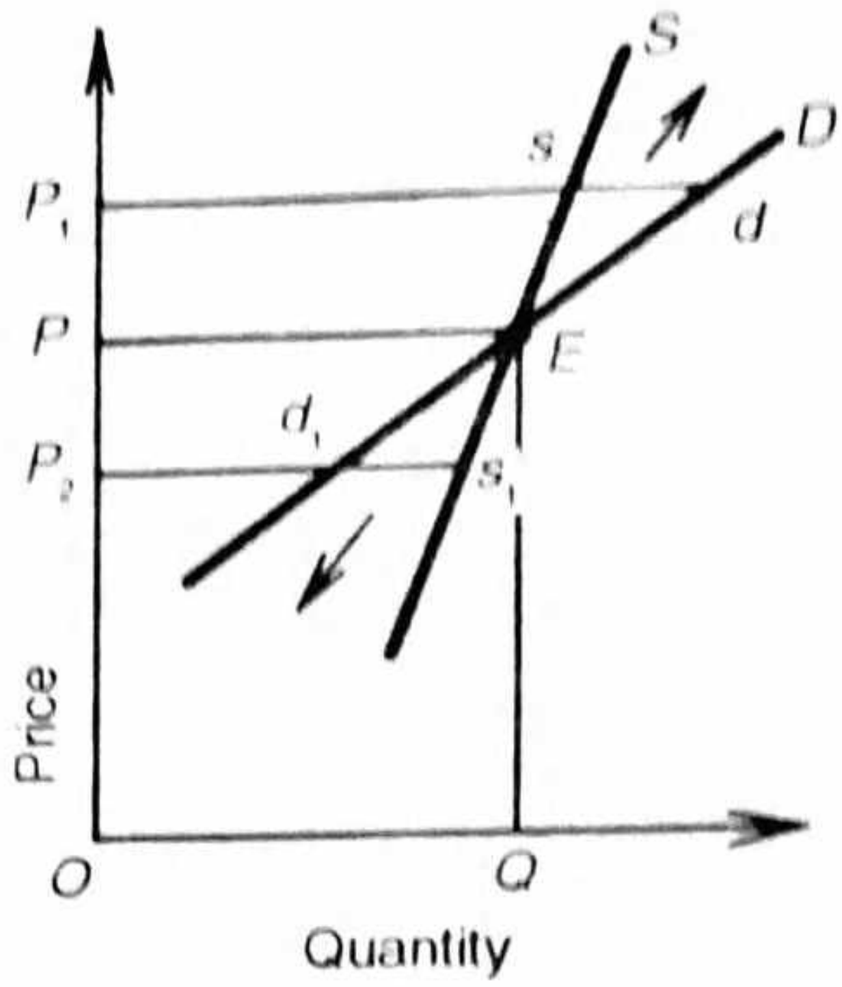

FIG. 42.3

Multiple equilibria also show stable and unstable equilibrium positions. Marshall considered a number of stable and unstable equilibrium positions with the help of zigzig demand and supply curves, as shown in Figure 42.4. He explains the stability conditions thus: "The equilibrium of demand and supply corresponding to the point of intersection of the demand and supply curves is stable or unstable according as the demand curve lies above or below the supply curve just to the right of the point."

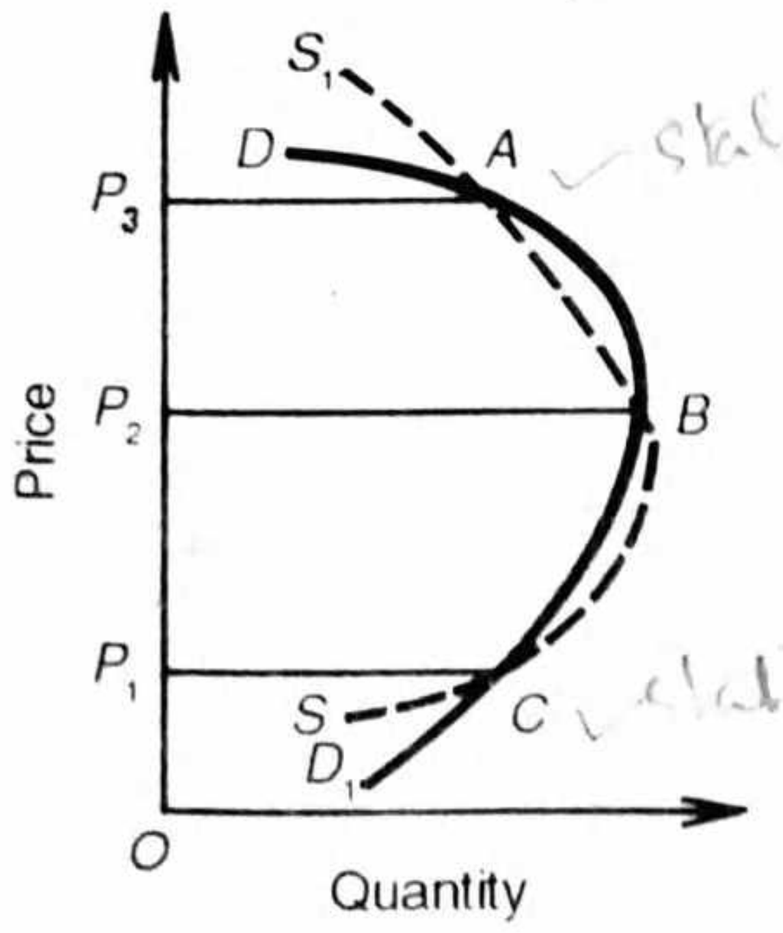

FIG. 42.4

Stability conditions under multiple equilibria are illustrated in Figure 42.4 where on the same demand DD_1 and supply SS_1 curves, there are three points of equilibrium A, B and C. Points A and C are of stable equilibrium. Point A is of stable equilibrium because if the price rises above OP_3, supply exceeds demand. Competition among sellers to sell their excess quantity will force the price downwards and the equilibrium will be restored at OP_3 price. If the price falls below OP_3, demand exceeds supply. Competition among buyers for less supply will raise the price back to the equilibrium level OP_3. Similarly, stability prevails at point C. If the price rises above OP_1, supply being more than demand, competition among sellers will bring the price down to the equilibrium level OP_1. If the price is below OP_1, demand being more than supply, competition among buyers will raise the price to the equilibrium level OP_1. In between is the point B which is of unstable equilibrium because if the price rises above OP_2, there is excess demand and competition among buyers for

less supply will lead to higher prices farther and farther away from the equilibrium point B. On the other hand, if the price falls below OP_2, there is excess supply. Competition among sellers will force the price down till the new stable equilibrium is attained at point C.

The above analysis is based on the Marshallian stability conditions. But in the case of Walras, stable and unstable equilibrium positions are reversed. Where the demand curve cuts the supply curve from above, the equilibrium will be unstable and where it cuts from below, the equilibrium will be stable. Thus A is the position of unstable equilibrium for Walras, B of stable equilibrium and C again of unstable equilibrium. This is because the Marshallian stability conditions are based on the *price-dependent approach*, while the Walrasian stability conditions are based on the *quantity-dependent approach*.[2]

However, in the Walrasian general equilibrium system, there is always stability of the market equilibrium. This is achieved through a repetitive process. If there is unstable equilibrium, each market will be adjusted to its equilibrium value. When this quantity-price adjustment process is repeated, the economy will attain general equilibrium through "groping" or trial and error. Empirical verification of the Walrasian system by Arrow and Hurwicz[1] has shown that the Walrasian system is stable, whereas some other studies have shown it to be unstable. According to Arrow and Debreu, the Walrasian general equilibrium system is stable if returns to scale are constant or diminishing, there are no externalities of consumption and production, and all goods are gross substitutes, i.e., a rise in the price of one good leads to positive excess demand for others.

3. Uniqueness of General Equilibrium

Equilibrium is unique when only one set of prices and quantities satisfies the equilibrium conditions. For example, equilibrium at point E as depicted in Figure 42.1 is stable and unique because only one price OP and quantity OQ bring stability of the market equilibrium which is unique.

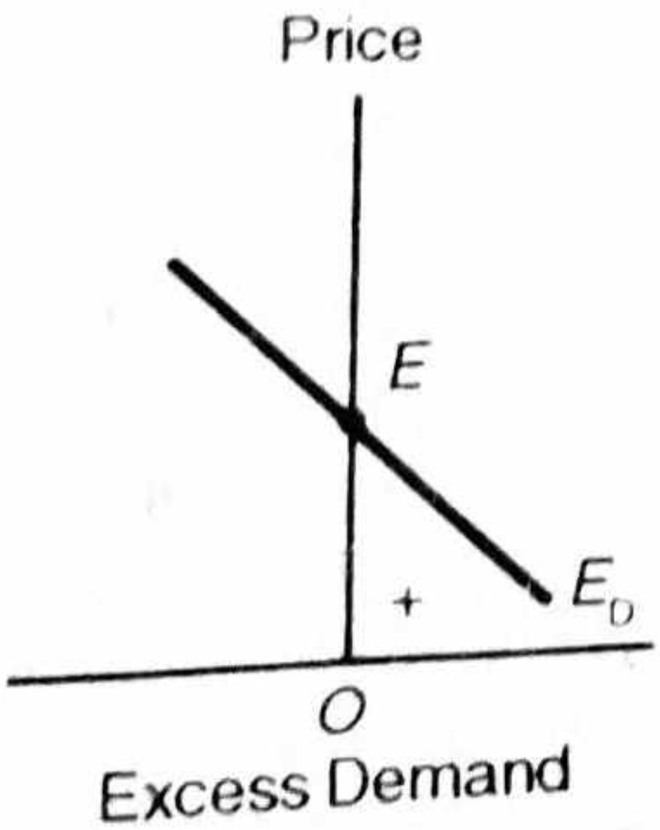

FIG. 42.5

The uniqueness of equilibrium is also explained in terms of the concept of *excess demand*. The excess demand (E_D) is defined as the difference between quantity demanded (Q_D) and quantity supplied (Q_S)

$$E_D = Q_D - Q_S$$

Geometrically, the excess demand is shown by the excess demand curve which is drawn on the basis of the difference between demand and supply curves at any one price. The excess demand curves for Figures 42.2 to 42.4 are redrawn below in Figures 42.5 to 42.7.*

[2] For a detailed analysis of the Marshallian and Walrasian stability conditions, refer to the chapter on "The Concept of Equilibrium" above.

[1] K. Arrow and L. Hurwicz, "On the Stability of the Competitive Equilibrium", *Econometrica*, 1958.

* Students must draw Fig. 42.2 with Fig. 42.5, Fig. 42.3 with Fig. 42.6 and Fig. 42.4 with Fig 42.7.

Take Figure 42.2. At the OP price, when the curve D cuts the S curve from above, the two curves are in equilibrium at point E. There is no excess demand or $E_D = O$. In the region where D exceeds S ($P_2d_1 > P_2s_1$), the excess demand is *positive* and where S exceeds D ($P_1s > P_1d$), the excess demand is *negative*.* In the case of the usual D and S curves, the excess demand curve has a negative slope, $E_D < O$. When the excess demand curve has a negative slope at the point of its intersection with the price axis, as at point E in Figure 42.5, the equilibrium is unique and stable.

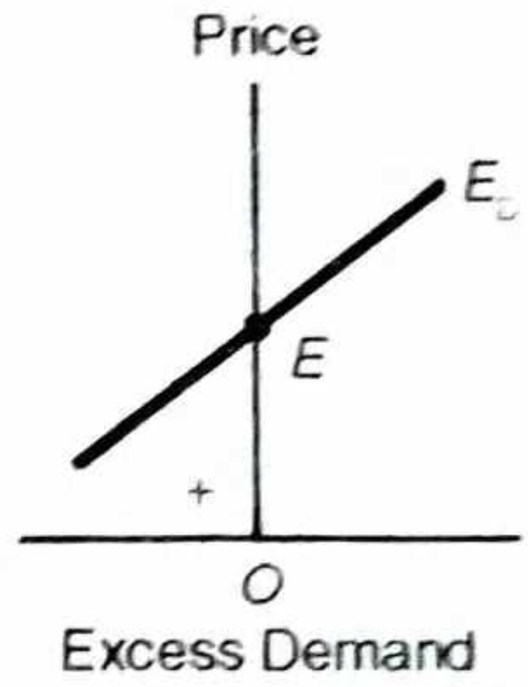

FIG. 42.6

Take Figure 42.3, where the demand curve cuts the supply curve from *below*. Here the excess demand is positive below the equilibrium price OP and it is negative above it. Therefore, the slope of the excess demand curve will be positive, $E_D > O$. When the excess demand curve has a *positive* slope at the point of its intersection with the price axis as at point E in Figure 42.6, the equilibrium is unique and unstable.

Figure 42.7 depicts the case of multiple equilibria when Figure 42.4 is redrawn with excess demand. The E_D curve intersects the vertical price axis at points P_1, P_2 and P_3 showing multiple equilibria. At points P_1 and P_3 where the slope of the E_D curve is negative, the two equilibrium positions are unique and stable. But at point P_2, the slope of the E_D curve is positive which reflects unique and unstable equilibrium.

The above analysis of the uniqueness and stability of equilibrium can be extended to the general equilibrium by taking the interrelationships and interdependencies of the commodity and factor markets simultaneously.

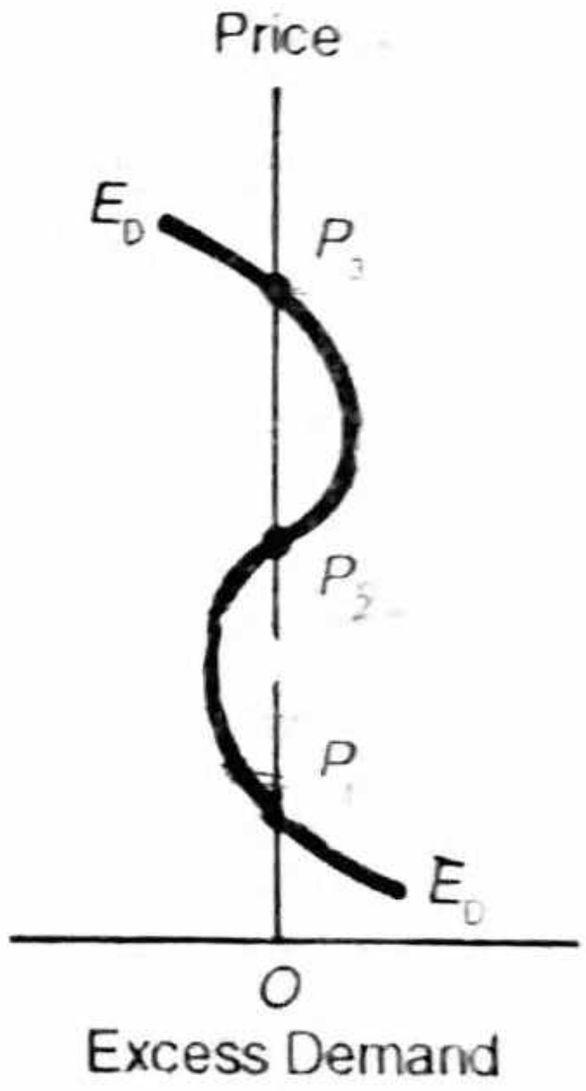

FIG. 42.7

3. THE WALRASIAN GENERAL EQUILIBRIUM MODEL

The French economist Leon Walras was the first to develop a general equilibrium model in mathematical form in his book *Elements of Pure Economics* published in 1874.[4] "Walras argued that all prices and quantities in *all* markets are determined

* Negative excess demand is excess supply.

[4] Leon Walras, *Elements of Pure Economics*, trans. by William Jaffe, 1954.

producer. Since the given Walrasian conditions are continuously changing, the movement towards general equilibrium is ever thwarted and its attainment has ever remained a wishful ideal.

Lastly, many of the assumptions cannot be removed from the theory for the entire Walrasian model is a set of simultaneous equations which breaks down in their absence. Thus this model thrives on equations which only make it cumbersome and difficult. This detracts its utility for the non-mathematical student of economics.

4. 2 × 2 × 2 GRAPHICAL GENERAL EQUILIBRIUM MODEL

We present below a graphical treatment of the general equilibrium of a *static* perfectly competitive economy composed of two consumers, two goods and two factors. This is known as 2 × 2 × 2 general equilibrium model.

Its Assumptions

The model is based on the following assumptions:

1. There is perfect competition in both the factor and goods markets.
2. There are two homogeneous and perfectly divisible factors of production, labour (L) and capital (K). The two are available in fixed quantities.
3. Both the factors are always fully employed.
4. Only two homogeneous consumption goods X and Y are produced in the economy. These goods are available in fixed quantities. The production function of each good is given and does not change. Each production function is smooth and shows constant returns to scale. There is diminishing marginal rate of technical substitution (MRTS) along any isoquant. It means that the isoquants are convex to the origin.
5. There are no externalities of production.
6. There are two consumers, A and B, in the economy who together consume all quantities of X and Y. Each consumer has a set of smooth indifference curves convex to the origin which shows consistent ordinal preference functions.
7. There are no externalities of consumption.
8. Each consumer aims at the maximisation of his utility subject to his given income.
9. The consumers own the two factors of production.
10. Each firm aims at profit maximisation subject to a given production function.

Given these assumptions, the economy is in general equilibrium when the two goods markets and two factor markets and two consumers and two firms are individually and simultaneously in equilibrium at a set of equilibrium prices. There are three properties for the solution of this general equilibrium model: (*i*) General equilibrium of exchange; (*ii*) general equilibrium of production; and (*iii*) general equilibrium in both production and exchange. They are discussed graphically as under:

(*i*) *General Equilibrium of Exchange (Consumption)*. The general equilibrium of exchange requires that the marginal rate of substitution between any two goods must be the same for each consumer who consumes both. It means that the mar-

ginal rate of substitution (MRS) between two consumer goods must be equal to their price ratio. Since under perfect competition each consumer aims at maximising his utility, he will equate his MRS for the goods X and Y to their price ratio (P_x/P_y). Given the two consumers A and B, two goods X and Y and the price ratio P_x/P_y in this model, the general equilibrium is attained when A chooses X and Y such that his ${}_AMRS_{xy} = P_x/P_y$, and B chooses X and Y such that his ${}_BMRS_{xy} = P_x/P_y$. Thus the condition of general equilibrium of both consumers is ${}_AMRS_{xy} = {}_BMRS_{xy} = P_x/P_y$.

The box diagram Figure 42.8 explains the equilibrium condition of exchange. Take two consumers A and B who possess two goods X and Y in fixed quantities respectively, O_a is the origin for consumer A and O_b the origin for B (turn the diagram upside down for its understanding). The vertical sides of the two axes, O_a and O_b, represent good Y and the horizontal sides, good X. The indifference map of A is represented by the curves A_1, A_2 and A_3 and B's map by B_1, B_2 and B_3 indifference curves. Any point within this box represents a possible distribution of the two goods between the two consumers. Take point E where the two indifference curves A_1 and B_1 intersect. At this position, A possesses O_aY_a units of Y and O_aX_a of good X. B receives O_bY_b of Y and O_bX_b of X. At point E the marginal rate of substitution between the two goods is not equal to the ratio of their prices because the two curves do not have the same slope.* So E is not the point of equilibrium exchange of the two goods X and Y between the two consumers A and B. But there is a basis for exchange between the two.

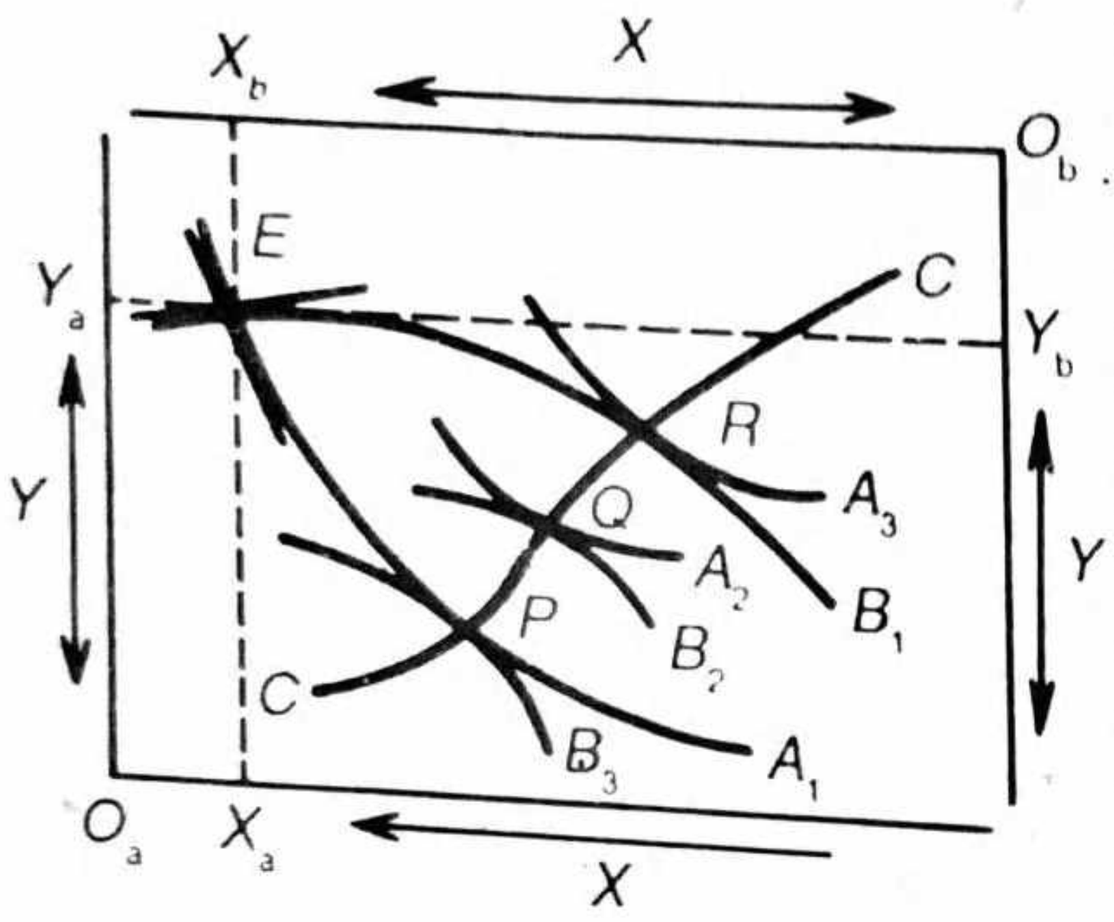

FIG. 42.8

Suppose A would like to have more of X and B more of Y. Let them move from point E to R. At R, A gets more of X, while B gets more of Y. There is no improvement in B's position because he is on the same indifference curve B_1, but A is much better off at R having moved to a higher indifference curve from A_1 to A_3. If, however, A and B move from E to P, A is as well off as before for he remains on the same indifference curve A_1. B becomes much better off having moved to a higher indifference curve, from B_1 to B_3. It is only when they move from E to Q that both are on higher indifference curves, A_2 and B_2 respectively.

P, Q, and R are thus the three conceivable points of exchange. When we join all such points by the line CC, it is the contract curve. It is the locus of all points of tangency of the two consumers' sets of indifference curves. General equilibrium of exchange will always occur on the contract curve where ${}_AMRS_{xy} = {}_BMRS_{xy}$. This general equilibrium of exchange *is not unique* because it can occur at any point on

* This can be seen f... tangents drawn on the two curves at point E.

the contract curve.

(*ii*) *General Equilibrium of Production.* The general equilibrium of production occurs whenever the marginal rate of technical substitution between labour and capital ($MRTS_{LK}$) in the production of good X is equal to the $MRTS_{LK}$ in the production of good Y ($_XMRTS_{LK} = {}_YMRTS_{LK}$).

The box diagram Figure 42.9 explains the general equilibrium of production. There are fixed amounts of two factors labour (L) and capital (K) available to the economy for the production of two goods X and Y. O_x is the origin of input labour which is measured along the horizontal axis, and O_x is of the input capital which is measured along the vertical axis. The horizontal sides of the two axes, O_x and O_y represent good X and the vertical sides good Y.

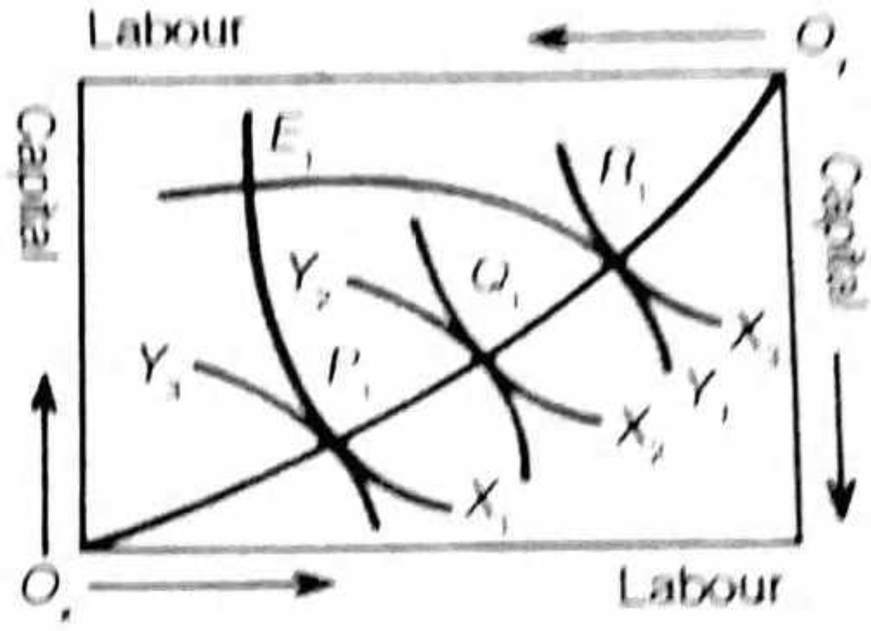

FIG. 42.9

The production function for each good is given by smooth isoquants which are characterised by constant returns to scale and diminishing marginal rates of technical substitution (MRTS). These isoquants are X_1, X_2, and X_3 for good X for which O_x is the origin, and Y_1, Y_2 and Y_3 for good Y for which O_y is the origin. If the economy were initially at point E_1, it would not be maximising its output of X and Y, because at E_1 the slope of X_1 exceeds that of Y_1, i.e., ${}_XMRTS_{LK} > {}_YMRTS_{LK}$. By substituting labour for capital, the firms can move from E_1 either to point R_1 or P_1. In either of these two cases, the output of one good would remain constant and the output of the other would increase. In this way, by substituting labour and capital, the firms can move to point Q_1 and increase the output of both X and Y. At points P_1, Q_1 and R_1, an isoquant of good X is tangent to an isoquant of good Y, and so satisfies the condition of general equilibrium of production. ${}_XMRTS_{LK} = {}_YMRTS_{LK}$. By joining these tangency points leads to the production contract curve $O_xP_1Q_1R_1O_y$ in the input space. It shows all combinations of capital and labour that equalise ${}_XMRTS_{LK} = {}_YMRTS_{LK}$ along this contract curve. But this general equilibrium of production is also *not unique* because it can occur anywhere along the contract curve.

From this production contract curve, we can trace the production possibility curve (or transformation curve) in the output space from the input space. The production possibility curve associated with the contract curve $O_xP_1Q_1R_1O_y$ of Figure 42.9 is plotted as TC in Figure 42.10. This curve shows the various combinations of X and Y that can be produced with fixed amounts of labour and capital. Consider point P_1 on the contract curve and the input space of Figure 42.9. If the isoquant Y_3 represents 600 units of good Y, and X_1 100 units of X, they are mapped in the output space as point P in Figure 42.10. Similarly points Q_1 and R_1 of Figure 42.9 are traced in the output space as points Q and R respectively in Figure 42.10. By joining points P, Q and R, we derive the production possibility curve TC for goods X and Y. With given amounts of labour and capital and fixed technology, the economy

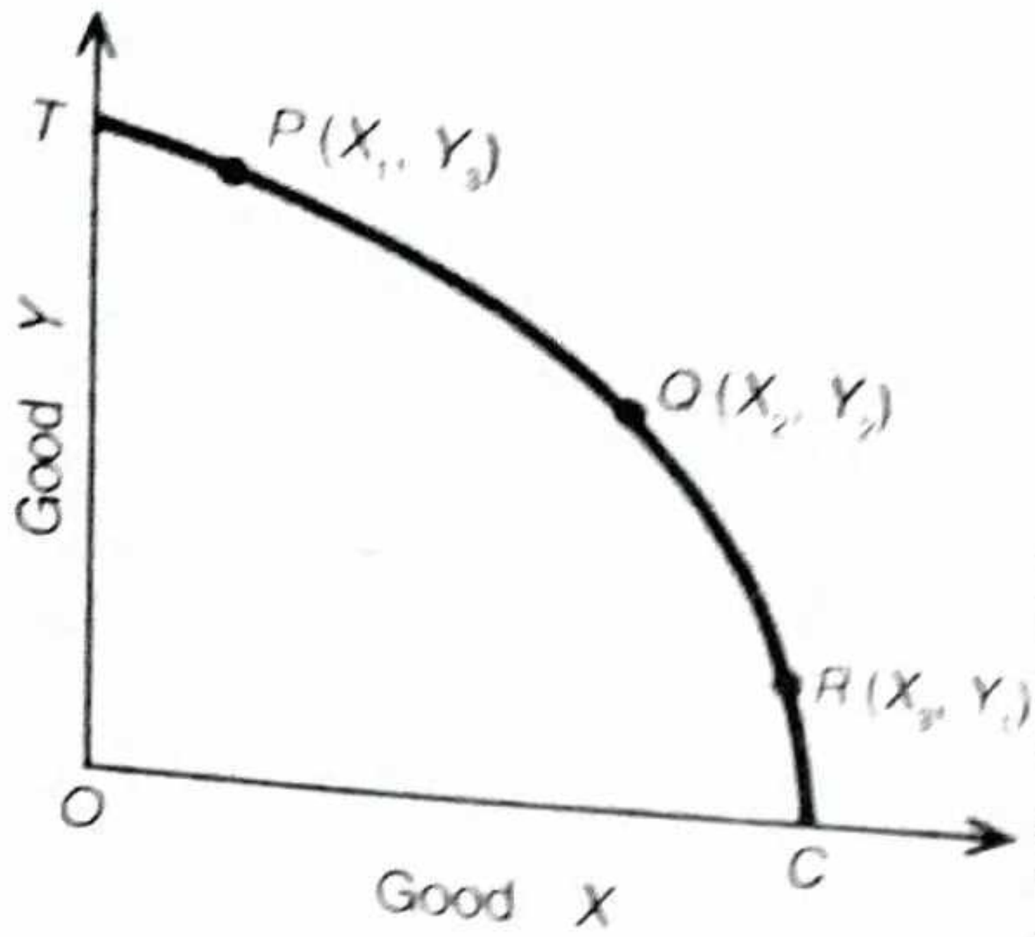

FIG. 42.10

librium of production when the isorevenue line is tangent to its transformation curve. It means that for the equilibrium of the firm the marginal rate of transformation between two products X and Y must equal their price ratio, i.e., $MRT = P_x/P_y$. This rule is explained in terms of Figure 42.11. MRT is measured on the diagram by the *slope* of the transformation curve PP at any point. TR is the isorevenue line whose slope shows P_x/P_y. At point E the slopes of the transformation curve PP and the isorevenue line TR are equal so that $MRT = P_x/P_y$. Thus each firm maximises its output by producing and selling OX_1 of commodity X and OY_1 of commodity Y.

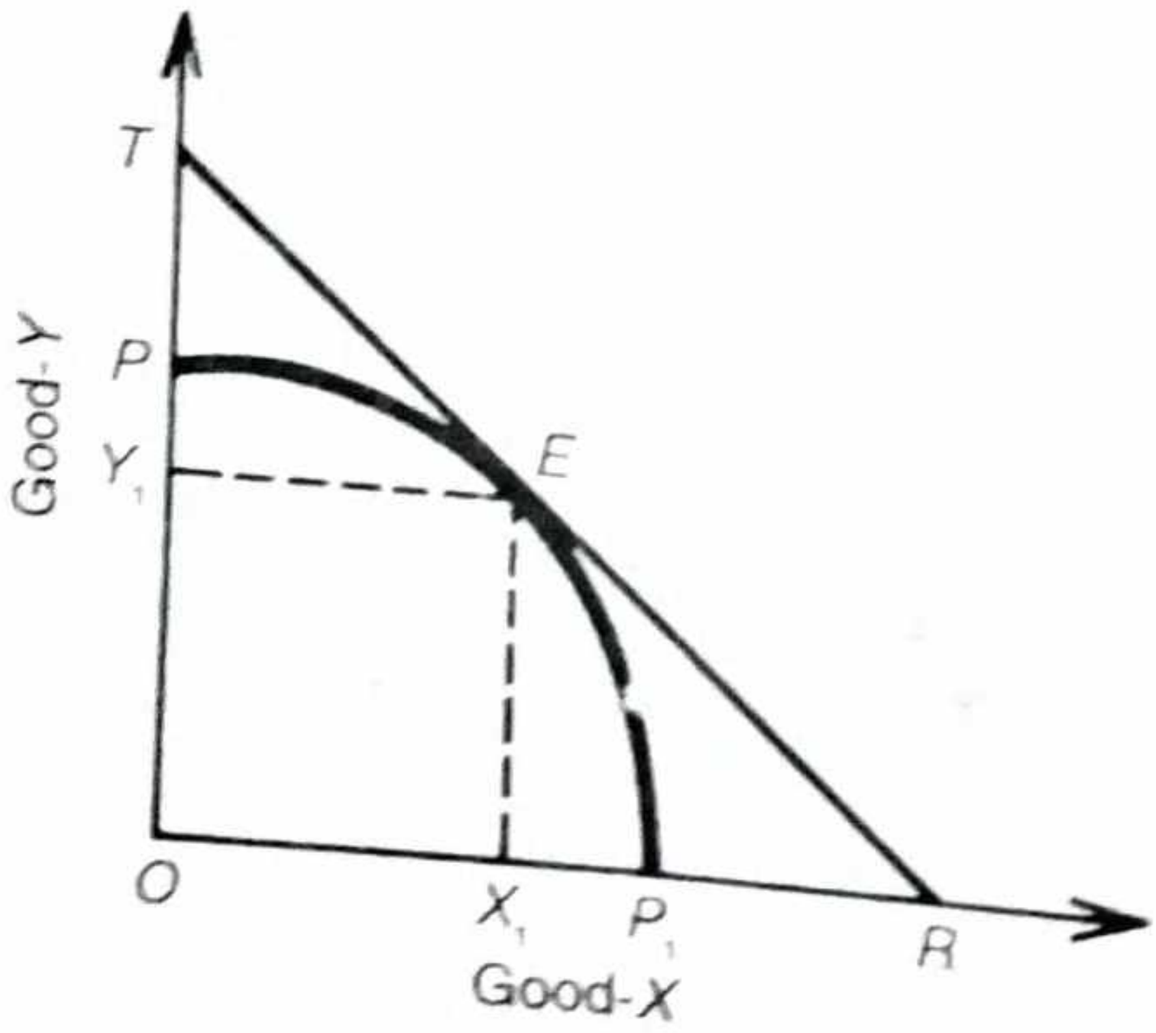

FIG. 42.11

In fact, the MRT of X for Y is equal to the ratio of the marginal cost of product X (MC_x) to that of product Y (MC_y) i.e., $MRT = MC_x/MC_y$. But each firm produces that level of output at which its marginal cost is equal to its market price. Therefore, for each firm $P_x = MC_x$ and $P_y = MC_y$. Hence $MC_x/MC_y = P_x/P_y$.

(iii) General Equilibrium of Exchange and Production. We now study the simultaneous equilibrium of exchange and distribution under perfect competition. This requires that the marginal rate of substitution between two goods must equal the marginal rate of transformation between them. Since the price ratios of the two

cannot attain any point above the TC curve. Nor can it have a point inside the TC curve for that will mean underutilisation of the two factor endowments. The economy must, therefore, be on the TC curve to maximise the outputs of X and Y. Further, the slope of any point on the production possibility curve of Figure 42.10 reflects the marginal rate of transformation (MRT) of X into Y. In other words, it indicates by how much the output of Y must be reduced by transferring enough capital and labour to produce one more unit of X.

A profit maximising firm under perfect competition will be in equi-

goods to consumers and firms are the same under perfect competition, the MRS of all consumers will be identical with MRT of all firms. Consequently, the two goods will be produced and exchanged efficiently. Symbolically, $MRS_{xy} = P_x/P_y$ and $MRT_{xy} = P_x/P_y$. Therefore $MRS_{xy} = MRT_{xy}$.

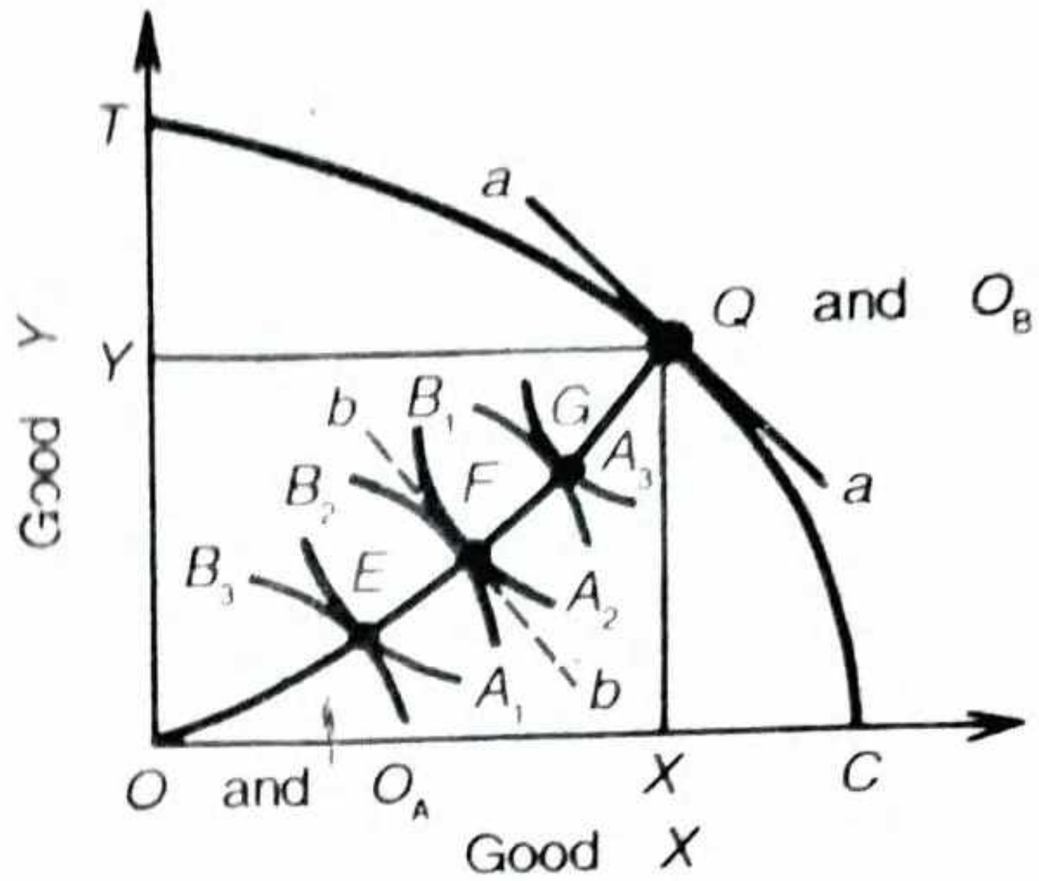

FIG. 42.12

Figure 42.12 illustrates the general equilibrium in consumption and production. *TC* is the transformation curve (or production possibility frontier) for the two goods *X* and *Y*. Any point on the *TC* curve shows MRT between *X* and *Y* (MRT_{xy}) where there will be general equilibrium of production. Select any point *Q* on the *TC* curve so that the total outputs of *X* and *Y* are *OX* and *OY* respectively. These outputs, in turn, determine the dimensions of an Edgeworth box diagram for exchange. Drop perpendiculars *X* and *Y* from *Q* on the two axis. Now *O* becomes the origin of consumer A. Let it be O_A. Similarly point *Q* becomes the origin of consumer B. Let it be O_B. Since each consumer has a well-defined preference function, indifference curves of A and B are drawn in the exchange box. Curves A_1, A_2 and A_3 represent A's preference map, and B_1, B_2 and B_3 are B's. The locus of tangencies of the indifference curves of A and B are *E*, *F* and *G*. By joining these points, we get a consumption contract curve $O_A EFGO_B$. Every point on this contract curve is a point of general equilibrium of exchange where ${}_A MRS_{xy} = {}_B MRS_{xy} = P_x/P_y$.

The simultaneous general equilibrium of exchange and production will occur where ${}_A MRS_{xy} = {}_B MRS_{xy} = MRT_{xy}$. This happens when the tangent *bb* drawn to the point of equilibrium at *F* of exchange is parallel to the tangent *aa* drawn to the point *Q* on the *TC* curve. But the condition given by the tangents *aa* and *bb* being parallel to each other at point *F* *does not* give a *unique solution*. This is because a tangent drawn each at point *E* or *G* can also be parallel to the tangent *bb*.

EXERCISES

1. Explain the problems of uniqueness, stability and existence of general equilibrium.
2. Explain the Walrasian General Equilibrium Model. Is it determinate?
3. Explain graphically the $2 \times 2 \times 2$ General Equilibrium Model.