MARGINAL PRODUCTIVITY THEORY OF DISTRIBUTION

AND

WAGE DETERMINATION

[Academic Script]

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Introduction:

Dear friends, welcome to the class of business economics. Today we are going to learn about marginal productivity theory of distribution.

Universal scarcity of resources has led to the emergence of three fundamental economic problems, namely,

- what to produce & how much?
- how to produce?
- for whom to produce?

Of these three, the final question deals with the problem of distribution of national income among four factors of production (namely land, labor, capital and enterprise) in the form of rent, wage, interest and profit. It seeks to find answer to the question – how are factor prices determined? (i.e. how is rent, wage, interest and profit determined?)

In economics, distribution means distribution of output, also known as national income or popularly called Gross Domestic Product [GDP]. The study of how national income is shared among various factors of production namely, land, labor, capital and entrepreneur is called the study of distribution.

This theory is alternatively called as the theory of factor pricing as it explains how national income is distributed amongst various factors of production in form of rent, wage, interest and profit which are factor prices as respective earnings of land, labor, capital and entrepreneur.

Broadly speaking there are two answers to this question as they have evolved in economic literature over many centuries, namely,

(i) a general answer in the form of marginal productivity theory of distribution (giving the general principle or basic framework of factor price determination) and

(ii) specific answers in form of different theories related to rent, wage, interest and profit.

Many theories have been developed to explain the determination of rent, wage, interest and profit separately but a general theory which provides an overall framework with which to understand this problem in respect of all factor prices is the MARGINAL PRODUCTIVITY THEORY OF DISTRIBUTION. This theory occupies prime and significant place in the section on distribution. In fact historically and logically it stands as the tallest theory in this group.This theory provides an analytical framework for the analysis of factor price determination.

The origin of marginal productivity concept is traced into the writings of economic thinkers of the 19th century. It was, however, J B Clark who developed the 'marginal productivity theory' as an analytical tool explaining wage determination.
In the last quarter of the 19th century many other economists, namely, Stanley Jevons, Wicksteed, Alfred Marhsall, J S Mill, Walras and Barone, made significant contributions to the development of the marginal productivity theory.

STATEMENT OF THE THEORY:

'In equilibrium the factor price can neither exceed nor be less than the marginal productivity or marginal revenue productivity of the factor in question'

In this theory marginal productivity or marginal revenue productivity is the cause of determinant of the factor price whereas price of the factor is the result.

4 CONCEPTS OF PRODUCTIVITY:

To understand this statement, we have to equip ourselves with four important concepts of productivity –

(i) ***Physical Productivity*** – it refers to the amount of commodity in terms of physical units which a factor unit helps to produce. For example, a labor can produce with given capital 10 chairs. So here 10 is the physical productivity of labor under discussion.

(ii) ***Marginal Physical Productivity (MPP)*** – It refers to the change in total output that occurs when one more unit of a factor of production is employed, keeping all other factors fixed. In our illustration, one labor can produce 10 chairs with given capital but when second labor joins him, the total output increases to 15 chairs which means that the

marginal or additional contribution of the second labor is 5 chairs or alternatively, MPP of second labor is 5.

These two concepts are relevant in case of barter economy. Since we do not discuss this type of economy, they are irrelevant for our discussion. Hence we try to understand the more relevant concepts –

(iii) ***Value of Marginal Physical Product (VMPP)*** – The price or money value of marginal physical productivity is called VMPP of a particular factor. It is obtained by multiplying MPP of a factor with the market price of the product that it produces. In our illustration let price of a chair be Rs. 500 so that value of marginal physical product of 2^{nd} labor is 5 chairs × Rs. 500 i.e. Rs. 2500. MPP and VMPP are exactly equivalent in substance – one is in physical units and one is in money units.

(iv) ***Marginal Revenue Productivity (MRP)*** – It refers to the change in total revenue of a firm due to the employment of an additional unit of a factor or it is also defined as the additional revenue which the firm would get by selling MPP. It is obtained by multiplying MPP of a factor by the marginal revenue (MR) that the firm earns when it employs one more unit of that factor of production. In our illustration, let us assume that price remains fixed. Hence, MRP of second labor would be Rs. 2500.

In perfect competition, VMP equals MRP as price equals marginal revenue but in all types of imperfect competition price is more than marginal revenue so VMP is greater than MRP.

EXPLANATION & PROOF OF THE THEORY:

This theory has been explained here in the context of wage determination but without loss of its substance it can be extended to other factor prices as well, particularly rent and interest as factor prices of land and capital respectively.

Demand for labor is a derived demand. It depends upon the marginal productivity of labor. Due to the operation of law of variable proportions or law of diminishing marginal returns, as additional laborers are employed, quantity of other factors remaining unchanged, marginal productivity of labor and MRP of labor as well starts decreasing after some point.

Suppose it is somehow found out that the MRP of labor is Rs. 30 in the economy, then this theory contends that wage will also be equal to Rs. 30.

Now suppose that for some reason wage is Rs. 25. As wage is less than the MRP of labor it will be in the interest of firms to employ more labor as by doing so they can increase their profits. Demand for labor will increase in the economy. Supply of labor being given, competition among firms to employ more labor will push up the wage till it becomes

Rs. 30 when it equals MRP of labor.

In the second situation, let us suppose that for some reason wage is Rs. 40 which is more than the MRP of labor. Here, the firms will realize that they are paying Rs. 40 per labor when it contributes only Rs.30 by way of earnings of the firm. It is now in the interest of the firms to reduce the number of laborers employed. Now those who have become unemployed will compete among themselves to get employment and in their attempt of doing so will push down the wage to Rs. 30 which is equal to the MRP of labor.

So, it has been proved in both the cases that ultimately wage will equal MRP of labor.

ASSUMPTIONS OF THE THEORY:

1. Firms aim at maximizing profits. So that if MRP of a factor is greater than its factor price, the firm gets the perception that profits can be increased by increasing the number of factor units. In the same way when factor price is greater than MRP of a factor, they reduce demand for factor till MRP rises and equalizes with factor price. This they would do only when they are motivated to increase their profits.
2. Law of variable proportion is applicable to the theory which states that as more and more units of a given factor are employed, keeping all other factors fixed, after some point marginal productivity of variable factor will ultimately start declining.

3. There is perfect competition in the product and factor markets i.e. buyers and sellers of both goods and factors are price takers.
4. All factor units are homogenous. This is a simplifying assumption.
5. There is one way relationship between marginal productivity and factor price. It is marginal productivity of a factor which determines its factor price and not the other way round.

LIMITATIONS OF THE THEORY:

1. In practice output is a cooperative effort of all factors. It would not be perfectly correct to state that the increased output due to the employment of an additional output is entirely due to it. Moreover, in real life it is not at all easy to determine marginal physical productivity of factors.
2. Under certain condition it is not possible to measure marginal productivity of a factor. e.g. in a large scale enterprise the addition or withdrawal of a unit of a factor can hardly have any effect on the total output.
3. Hobson has criticized the theory on the ground that in many cases it is difficult to change the proportion in which factors are used.
4. According to Marshall this is a one-sided theory as it considers only the demand side of a factor which is determined by its marginal productivity and assumes the supply of a factor to be

given. In real life, according to him, like all other values, factor prices too are determined by demand and supply of factor units.

5. Real life is characterized by imperfect markets both for commodities and factors of production against perfect competition as postulated in the theory.
6. In case of factors like labor homogeneity condition is not satisfied. It is a well known fact that laborers differ from one another in respect of skills, training, education, knowledge, experience, etc.
7. There is a two-way relationship between marginal productivity and factor prices. For example, change in wage affects marginal productivity of laborers. If laborers are paid higher wages than before, they can afford better quality of food, clothing, housing, etc. which ultimately increases their marginal productivity.
8. Factor prices are determined not only by the marginal productivity of factors but by institutional factors as well. For example, minimum wage legislation and trade union movements influence the wage level being paid out to laborers. Similarly, ceilings and floors on interest rate determination by the central bank may explain why interest rates depart from their marginal productivities.
9. This theory cannot explain determination of profit because it is not possible to change the number of entrepreneurs in a firm therefore marginal productivity of an entrepreneur cannot be measured.

SUMMARY:

According to marginal productivity theory of distribution, all factor prices equal their respective marginal revenue productivities, given the assumptions of perfect competition in goods and factor markets and homogeneity of factor units. Any deviation of factor price from marginal revenue productivity of factor will automatically be corrected by the market mechanism.

Wage Determination

Dear friends, in continuity of the marginal productivity theory of distribution we now try to understand the process of wage determination.

Wage in layman's language is defined as the price of labor. It is the remuneration earned by labor for his/her physical and mental efforts put with an objective of earning some reward, monetary or non-monetary.

Like all other factor prices, wages too according to modern economists are determined by the forces of demand for and supply of labor.

Therefore, we will first have to understand two basic aspects related to wage determination – demand for labor and supply of labor. Then we will have a look at the process of wage determination, first in case of perfect competition and then in monopoly.

Demand for labor:

A firm demands labor because it helps in producing goods and services. Labor is not demanded for its own sake. It is demanded only because it is helpful to produce goods and services which can be sold in the market and through which profit can be earned. The demand for labor, therefore, is a derived demand. It is derived from the demand for goods which it helps to produce. Demand for labor is inversely related to wage rate i.e. as the wage rate increases, demand for labor decreases as it becomes costly in relation to other factors. And with a decrease in wage rate, demand for labor increases as it becomes cheap in relation to other factors. It is assumed here that the sole object of firm is to maximize profit.

Supply of labor:

There is a direct relationship between wage rate and supply of labor i.e. as the wage rate increases, supply of labor too increases and with a decrease in the wage rate, supply of labor too decreases. This is true up to a certain wage rate. But if wage increases beyond it, then the supply of labor will decrease. This is because at a very high wage rate, labor would prefer leisure to work. This will make supply of labor curve backward bending. But for the purpose of our discussion, we will be concerned only with the positively sloped part of supply of labor curve.

WAGE DETERMINATION IN PERFECT COMPETITION:

Let us begin by understanding the problem of wage determination in a perfectly competitive market.

A firm operating in a perfectly competitive labor market, in order to maximize profit will go on employing more and more units of labor as long as marginal revenue product of labor is greater than the prevailing wage rate. The MRP of labor in the beginning rises and then starts declining as per the law of variable proportions.

It can be said that a firm working under perfect competition both in the labor market and product market will be in equilibrium at that level of labor employment where MRP of labor is equal to wage rate.

Now for a firm the demand for labor curve will be downward sloping as discussed above. By adding the demand for labor for all firms at various wage rates will give us the industry demand curve for labor. Diagrammatically this is done by horizontal or lateral summation of demand curves of various firms.

Supply of labor curve as discussed above will be positively sloped.

In the market equilibrium wage is determined jointly by demand for labor and supply of labor. The point at which demand for labor intersects supply of labor, equilibrium wage is determined.

As shown in the diagram, 'e' is such an equilibrium point at which demand for labor becomes equal to supply of labor at the wage rate OW_1. At this wage OL_1 units of labor are demanded and supplied.

If for some reason wage increases above equilibrium e.g. OW_1, then supply of labor will be more than demand for labor. This will lead to competition among laborers to get job. As a result wage rate will decrease and come back to OW. On the other hand if for some reason

wage rate decreases below equilibrium e.g. OW_2 then demand for labor will be more than supply of labor. This time there will be competition among firms to get more labor. As a result wage will start increasing till it reaches OW.

DETERMINATION OF WAGE UNDER MONOPOLY:

Now let us try to understand the process of wage determination under monopoly.

A firm is a monopolist in the product market but there is perfect competition in the labor market. Since the firm has monopolistic power in the product market the demand curve for the product will be downward sloping and marginal revenue will be less than price at all levels of output therefore the demand curve for labor of an individual firm will be marginal revenue productivity of labor (MRP_L) curve. As there is perfect competition in labor market the supply of labor to an individual firm is perfectly elastic.

MRP_L is the demand curve for labor of an individual firm S_L is the supply curve of labor to the individual firm. Since the firm aims at maximum profit it will employ OL_1 units of labor because at this level of employment marginal cost of labor is equal to MRP_L.

We have assumed perfect competition in the labor market. So the market demand curve for labor is obtained by adding up the demand curves of all firms. The market demand curve for labor like the demand curve of individual firms will be downward sloping. So far as supply curve of labor for an industry is concerned, it will be upward

sloping. In the labor market, wage rate will be determined by the intersection between demand and supply curves.

In the figure on the left side D_L is industry demand curve for labor and S_L is industry supply curve of labor. These curves intersect at point 'A' therefore 'OW' is equilibrium wage rate and 'OB' is equilibrium level of employment.

Since there is perfect competition in the labor market, the equilibrium wage rate 'OW' determined by the industry is accepted by all individual firms. Therefore the supply curve of labor for an individual firm in the diagram on the right side is taken as the horizontal straight line passing through 'W'. In this situation marginal cost of labor (MC_L) is equal to average cost of labor (AC_L) for the firm. The demand curve for labor for the firm is MRP curve for labor. The two curves intersect at point 'E', therefore firms employ 'OC' amount of labor.