[Academic Script]

Factor Pricing

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Unit No. & Title:	Unit – 2 Factor Market
Lecture No. & Title:	Lecture – 2 Factor Pricing

Academic Script

1. Introduction

Production is defined as the transformation of inputs into outputs. Inputs are all productive resources that a firm buys while the outputs are all goods and services that the firms produces for sale. Productive resources used in the process of production are called the 'factors of production'. Four factors of production are recognized in economics. They are (i) labour, (ii) capital, (iii) land, and (iv) entrepreneurship. Although all the factors are treated as complementary, a typical situation allows some degree of substitutability among them. Brief description of the factors is given below.

Labour: Labour is the mental and physical work of people (excluding entrepreneurship) that is used for the production of goods and services. The price of labour is wage rate.

Capital: Capital is of two types (i) physical capital and (ii) financial capital. Technically, the term capital refers to physical capital i.e. the facilities, equipment, inventories and other physical resources used to produce goods and service. But in theory, capital refers to financial capital as well.

Land: The term land refers to all the natural resources, which are available above the ground and also under the ground. The cost of land use is measured in terms of rent.

Entrepreneurship: Entrepreneur is a person who combines the factors of production and carry out the production process. Payment for an entrepreneur is the profit margin.

Factor Market

A factor market is different from the market of products. Firms produce the products for sale. On the other hand require the

factors of production to produce goods that the firm sells. Thus in factor markets the firm buy and households sell. A factor market facilitates the purchase and sale of the factors of production.

Depending upon the changes in demand for products and profit margins, the firms decide to change their output pattern, which has direct impact on the demand for the factors of production. Therefore, the demand for a factor of production is the derived demand.

Difference between Product Price and Factor price

Price theory concerns with the determination of product prices as well as factor pricing.

Product Price: Product price is the amount of money that is paid by the households to buy goods and services.

Factor Price: The price of a factor represents an income to its owner. For example, payment of wage is the price of labour, rent is paid for use of land and interest is paid to obtain financial capital. Similarly an entrepreneur earns profits for his business vision and risk taking abilities. The price of each factor is based on its supply and demand.

Concepts Explained

Marginal Revenue Product (MRP): MRP is obtained by calculating the difference between two successive total revenues. MRP occurs due to the employment of an extra unit of a factor of production.

Value of Marginal Product (VMP): VMP means the marginal physical product (MPP) of a factor multiplied by the price of the product. Price of product is average revenue (AR). Thus,

VMP = MPP x AR (or Price)

In perfect competition the price of the product is same as it marginal Revenue. Therefore, in perfect competition

VMP = MRP

Average Factor Cost (AFC): In every market structure the AFC is calculated by dividing the total factor cost (TFC) by the quantity of the factor purchased. AFC is generally equal to the factor price. Thus

AFC = TFC / Factor Quantity = Price of the Factor

Marginal Factor Cost (MFC): MFC is also known as marginal input cost.MFC is the change in total factor cost caused by hiring an additional unit of the factor. Thus

MFC = ΔTFC / ΔFactor Quantity

Profit Maximization Condition: A firm will maximize profits when marginal revenue product (MRP) of a factor equals its marginal factor cost (MFC). Thus

MRP = MFC

The equality of MRP with MFC is necessary, but not sufficient. To achieve equilibrium, the fulfillment of a second order condition is also required. That is, at the equilibrium point, the MRP curve must cut the MFC curve from above.

Under perfect competition in product market, the MRP of a factor equals the value of its marginal product (VMP). Thus, the firm will achieve equilibrium when VMP = MFC.

Marginal revenue (MR) = Δ total revenue/Δtotal output

Marginal product (MP) = Δtotal output/Δin quantity of factor

2. Derived Demand for a Factor of Production

As per the neo classical theory of pricing of the factors of production, in conditions of perfect competition, the forces of demand for and supply of factors determine their prices. Since the factors of production are required for the production of goods, they do not directly satisfy the wants of people. Their demand is derived because they are used to produce goods, which are wanted by consumers. The greater the demand for a good produced by a particular type of factor, the greater would be the demand for that factor.

Demand for Labour in Competitive Markets

In perfectly competitive product market, an individual firm cannot influence the price by changing the quantity of output. Hence, it takes the ruling price in the market as given and only adjusts its production to maximize profits. Thus in a perfectly competitive market, the average revenue curve AR of the firm is a horizontal straight line and marginal revenue curve MR coincide with it. In other words AR is equal to the MR. Therefore a firm working in perfectly completive product market, will have its marginal revenue product of labour (MRP) equal to its value of

marginal product (VMP). Hence under perfect competition the MRP curve of labour and VMP curve of labour will be same.

It is important to mention that the labour market will be perfectly competitive when

a) Labour is homogenous and buyers (employers) are identical from the point of view of sellers (workers).
b) Both the buyers and sellers possess perfect information about the current factor prices (wage rate).
c) The number of buyers and sellers is very large.
d) Both the buyers as well as the sellers are free to enter or leave the labour market.

When a firm confronts perfect competition in labour market, the supply curve of labour will be perfectly elastic represented by a horizontal straight line. Thus wage rate W will be equal to the marginal factor cost MFC of labour.

Demand Curve of a Single Variable Factor (Labour)

The objective of a firm is to maximize profits due to which it produces that much quantity of output at which its marginal revenue (MR) equals the marginal cost (MC). The marginal cost of labour is determined by the wage rate, which is determined by the demand for, and supply of labour in the market. The labour market is assumed to be perfectly competitive in the short run in which the wage rate remain unchanged. Hence, the marginal factor cost of labour will be equal to the wage rate. Therefore, at equilibrium wage rate, the value of the marginal product of labour VMP_L will equals the marginal revenue product of labour MRP_L.

In fig.1 if the market price of labour (wage) is OW_0, then the firm will employ ON units of labour since at ON, the MRP of labour is equal to wage OW_0. Now if the Wage rate falls to OW_1, the demanded for labour will increase to ON' where the marginal revenue product MRP of labour is equal to the new wage rate OW_1. If wage rate again falls to OW_2, then the demand for labour will rise to ON". This relationship between the wage rate and demand for labour gives a downward sloping demand curve for labour, which by definition is the same as VMP of labour curve.

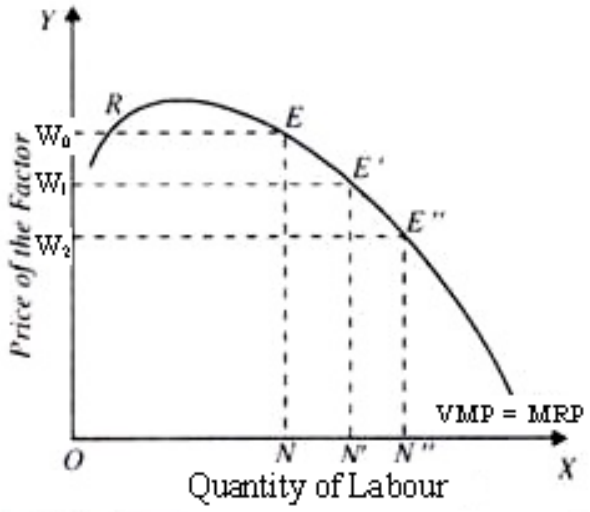

Figure 1: Derivation of demand curve for a single variable factor (labour)

Generally the MRP curve of labour moves upward in the initial phases up to certain point and then slopes downward. It should be noted that only the downward sloping portion of the VMP curve forms the demand curve for the factor (labour). This is because the firm cannot be in equilibrium when the VMP of labour rises. For instance, with market price OW_0, the entrepreneur will not be in equilibrium at point R since at R, VMP curve is cutting the factor cost curve (wage rate line) from below. However, the firm will be in equilibrium at point E where

VMP curve cuts the factor cost curve (wage rate line) from above. Hence after employing ON number of labour, the firm will stop hiring workers.

3. Demand Curve of Labour With More Than One Variable Factor

Short run demand curve for labour of a firm is based on three assumptions viz., (i) perfectly competitive labour market (ii) constant supply of capital, and (iii) marginal revenue product curve (MRP) of labour is given. In the long run, the firm is expected to make necessary adjustments in the use of capital, when labour employment change due to change in wage rate. An increase in labour employment due to fall in wage rate would prompt the firm to adjust the input of capital and other fixed factors by reducing their use.

The demand for labour by a firm in the long run can be explained by assuming only two factors viz., labour and capital are used. The firm purchases the two factors until the ratio of marginal revenue products of labour MRP_L divided by wage equal the ratio of marginal revenue products of capital MRP_K divided by interest rate. That is

$$MRP_L / w = MRP_K / r$$

Now when wage rate falls, (other things remaining same), a firm moving along MRP curve will demand more labour. But, the employment of more labour will raise the marginal revenue productivity of capital if its quantity remains unchanged which causes disturbance in the equilibrium. In order to minimize costs and maximize profits, the firm will increase the use of capital, which yield more profits. The substitution of capital for labour

would lead to a fall in wage rate. In the long run the demand for labour, will be determined by the equality of the wage rate with the marginal revenue product of labour, which will also correspond to the change in the use of capital.

Fig. 2 shows the derivation of long run demand curve of Labour when capital is adjusted. To begin with first draw the marginal revenue product MRP curve of labour VMP_1 with a given amount of capital K_1. At wage OW_0, the firm demands ON_0 units of labour, which is the equilibrium point E at VMP_1 curve (OW_0 = VMP_1 at ON_0). Now if the wage rate falls to OW_1, the demand for labour by the firm will increase to ON_1 provided capital stock remain constant at K_1. However a rise in employment of labour at lower wage OW_1 will increase the marginal revenue product of capital. Hence the firm would adjust the quantity of capital. Suppose with this adjustment the capital stock increases to a new level K_2. This increase in capital to K_2 will cause a shift in the marginal revenue product curve of labour to the new position VMP_2. This new marginal revenue product curve of labour (VMP_2) is obtained after adjusting the quantity of capital to a new level K_2 when the wage rate falls to OW_1. Now the firm will demand ON_2 units of labour, which is determined by the equilibrium point B at the VMP_2 curve. A curve drawn through equilibrium points E and B represents the demand for labour curve when capital is also variable and adjusted suitably.

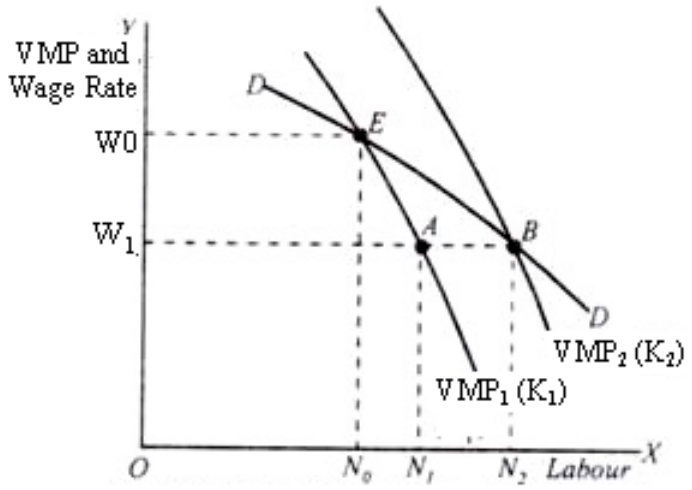

Figure2:Long-run demand for labour with capital adjustment

4. Wage Determination in Perfectly Competitive Labour Market

In perfectly competitive labour market, an equilibrium between the demand for and supply of labour determines the wage rate. Since the marginal revenue product of labour (MRP) governs the demand for labour, therefore, a firm will employ that much number of workers at which wage rate equals MRP of labour.

In Fig.4, DD represents the demand curve for labour and SS represents its supply curve. The two curves intersect at point E, which states that at wage rate OW, the quantity of labour demanded (ON) is equal to its availability (supply). This indicates that all those who are willing to work at the given wage rate OW, get employment. This also implies that there is full employment in the labour market.

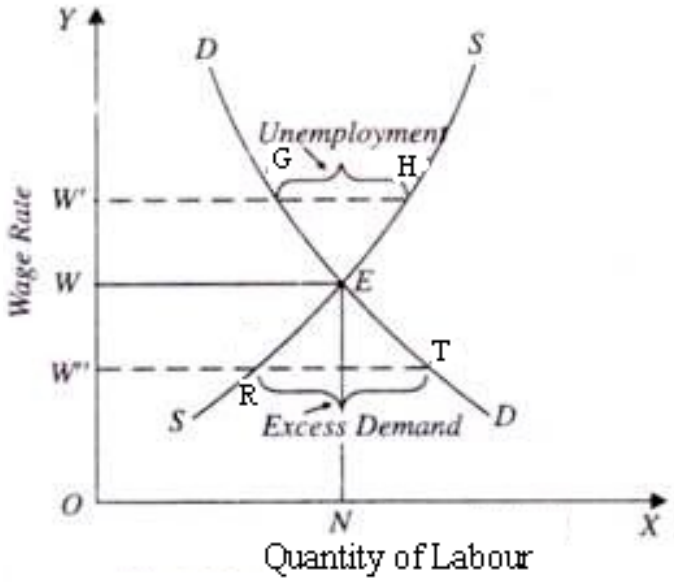

Fig. 4: Wage determination by equilibrium between demand and supply of labour

It is important to note that the wage rate cannot be maintained at higher or lower than OW level. If the wage rate is fixed at a higher-level OW', then the supply of labour will increase to W'H while the demand for labour by a firm will decline to W'G. Apparently the new supply of labour W'H is more than the new demand for labour (W'G). A fall in the demand for labour would cause involuntary unemployment to the extent of GH. Hence there will be competition for job among the unemployed workers due to which the wage rate will fall to OW where the quantity demanded equates with the quantity supplied. On the other hand if the wage rate is fixed at a lower level OW", the supply of labour (W"R) will be less than the quantity demanded (W"T). The situation of excess labour demand (equal to RT) will push up the wage rate upward to the level of OW where the quantity demanded equals the quantity supplied.

Although the wage rate is determined by the demand for and supply of labour, still to maximize profits, the firm will compare

the wage rate with the value of the marginal product of labour (VMP_L). If the firm employs less than ON number of workers, the VMP_L will be higher than the wage rate which indicates further scope for earning more profits by hiring additional labour. On the other hand, if the firm pays higher wages to employ more workers than the equilibrium wage, then the VMP_L will fall below the wage rate due to which the firm will incur losses. Hence the firm will reduce labour to the equilibrium level ON. Thus under conditions of perfect competition in the factor and product markets a firm will equate the wage rate with the value of marginal product (or marginal revenue product) of labour.

It may be noted that in the short run, when the firms achieve equilibrium by equating the VMP_L to the wage rate, they may be making super-normal profits or losses depending upon the level of employment. Fig.5, shows the equilibrium position of a firm in the short run. The firm is in equilibrium when it employs OM number of labour where the VMP_L is equal to the wage rate OW. However, at OM level of employment, the average revenue product of labour ARP_L is BM, which is higher than wage rate OW by AW (or BF). Thus the firm is making supernormal profits equivalent to ABFW. Earning of super-normal profits by a firm will motivate new entrepreneurs to invest for producing similar products. Since there is gestation period between decision making for investment and start of production, therefore, in the long run, the demand for labour will rise. A rise in the demand for labour will raise the wage rate and eliminate the super-normal profits. Thus in the long run, the equilibrium between demand for and supply of labour is established at the level where

the wage rate of labour is equal to both the VMP (MRP) and ARP of labour and the firms earn only normal profits.

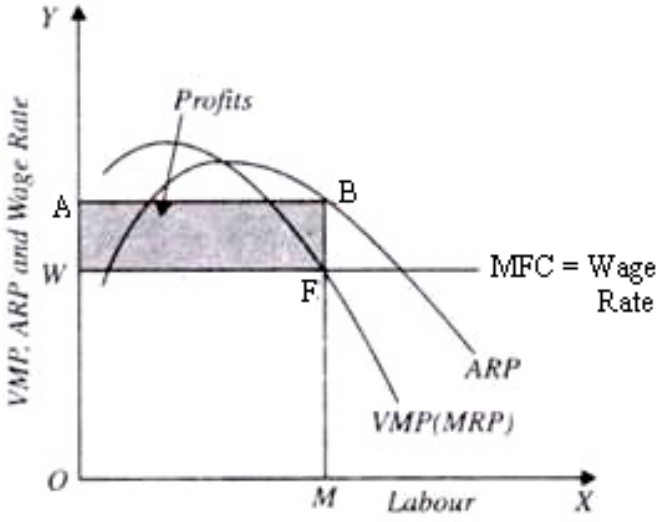

Fig. 5: Factor price determined by demand and supply of factor equals the value of marginal product of labour

5. Wage Determination in Perfectly Competitive Labour Market and Imperfectly Competitive Product Market

A firm working in a situation of perfect competition in labour market and monopoly or imperfect competition in product market will achieve equilibrium when MRP equals MFC i.e. wage rate and MRP curve cuts the MFC (wage rate) curve from above. Due to perfect competition in labour market, the firm it has no control over wage rate and hence the marginal cost of labour (MFC). Hence the supply curve of labour for an individual firm will be a horizontal straight line.

A firm working under conditions of monopoly in product market, can control or influence the price of the product. In this situation, its AR curve slopes downward and MR curve will lie below the AR curve. Since MR is less than the price of the product, under monopoly or imperfect competition, MRP will be less than VMP of

labour. Therefore, the labour will get wage rate less than the value of its marginal product.

Fig.6 explains the determination of wage rate in a situation of perfect competition in labour market and monopoly or imperfect competition in product market. Since VMP of labour is greater than MRP of labour (LH>LF) when there is imperfect competition in the product market, the VMP curve lies above the MRP curve. The firm will be in equilibrium at F where it equates wage rate with marginal revenue product of labour (MRP). The equilibrium level of employment of Labour of the firm is OL. Fig.6 shows that at equilibrium, the wage rate OW is equal to LF level of the MRP, which is less than LH level of the VMP. Thus the labour gets FH amount less than its marginal product.

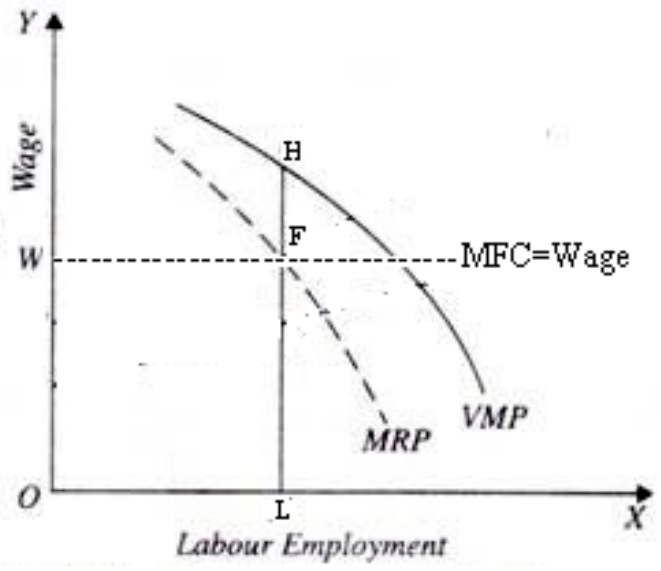

Fig. 6: Wage determination under perfect competition in labour market and imperfect competition in product market

6. Summary

Factors of production refer to the resources that are used to produce a good. The demand for a factor is governed by demand for products and profit margins based on which the firms decide to

change their output pattern. Therefore, the demand for a factor of production is the derived demand. Thus the two terms viz. 'factor market' and 'product market' are different. In perfectly competitive labour market, a firm has no influence over wage rate, Therefore, to maximize profits the firm will employ that much number of workers at which the wage rate equals the MRP of labour.