References: Mankiw. N. G: Macroeconomics (5th Ed)

Classical System

The Classical model of income and employment is a formalized version of the ideas of classical economists like Adam Smith, David Ricardo. They believe in **Say's Law of market**. Say's Law of market states that supply creates its own demand and there is no possibility overproduction. Classiscal economists believe that in an economy there exists an automatic mechanism which brings about full employment of labour. This automatic mechanism is known as **"invisible hand"**.

In the classical model the economy is divided into four markets.

- Labour market
- Money market
- Commodity market
- Bond market

At first we consider the labour market.

Factors of production are the inputs used to produce goods and services. The two most important factors of production are capital and labor. Labor is the time people spend working.
We use the symbol K to denote the amount of capital and the symbol L to denote the amount of labor. In this chapter we take the economy's factors of production as given. In other words, we assume that the economy has a fixed amount of capital and a fixed amount of labor.

$$K = \bar{K}$$
$$L = \bar{L}$$

The over bar means that each variable is fixed at some level. We also assume here that the factors of production are fully utilized—that is, that no resources are wasted. That is we assume that capital and labor are fully employed.

The Production Function

The available production technology determines how much output is produced from given amounts of capital and labor. Economists express the available technology using a **production function**. Letting Y denote the amount of output, we write the production function as

$Y = F(K, L)$.

This equation states that output is a function of the amount of capital and the amount of labor.

The production function reflects the available technology for turning capital and labor into output.

The Supply of Goods and Services

We can now see that the factors of production and the production function together determine the quantity of goods and services supplied, which in turn equals the economy's output. To express this mathematically, we write

$$\bar{Y} = F\left(\bar{K}, \bar{L}\right)$$

In this chapter, because we assume that the supplies of capital and labor and the technology are fixed, output is also fixed (at a level denoted here as $\bar{Y}$).

Factor Prices

Factor prices are the amounts paid to the factors of production. That is the wage workers earn and the rent the owners of capital collect. As Figure **1** illustrates, the price each factor of production receives for its services is in turn determined by the supply and demand for that factor. Because we have assumed that the economy's factors of production are fixed, the factor supply curve in **Figure 1** is vertical.

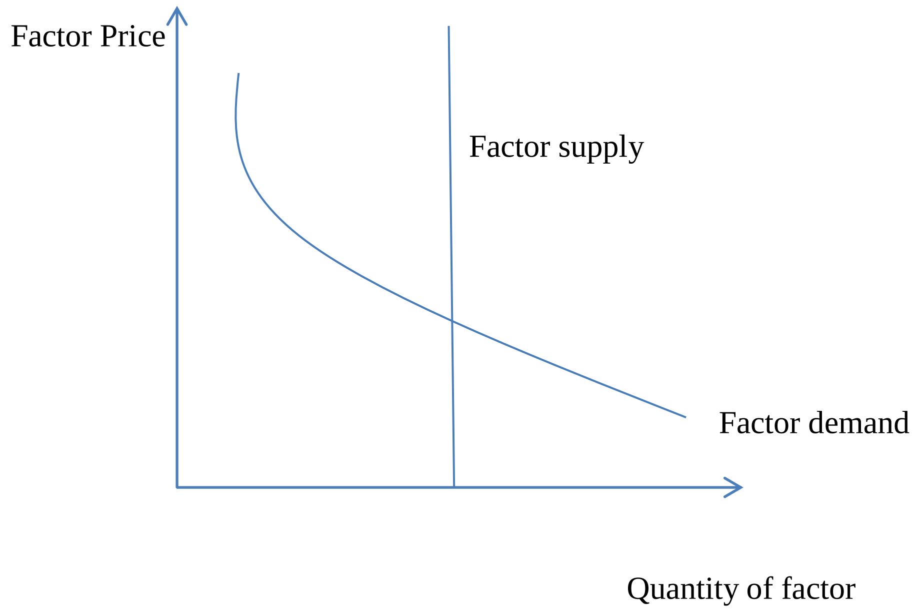

Figure-1

The intersection of the downward-sloping factor demand curve and the vertical supply curve determines the equilibrium factor price. To understand factor prices and the distribution of income, we must examine the demand for the factors of production. Because factor demand arises from the thousands of firms that use capital and labor, we now look at the decisions faced by a typical firm about how much of these factors to employ.

The Decisions Facing the Competitive Firm

The simplest assumption to make about a typical firm is that it is **competitive**. A competitive firm is small relative to the markets in which it trades, so it has little influence on market prices. For example, our firm produces a good and sells it at the market price. Because many firms produce this good, our firm can sell as much as it wants without causing the price of the good to fall, or it can stop selling altogether without causing the price of the good to rise. Similarly, our firm cannot influence the wages of the workers it employs because many other local firms also employ workers. The firm has no reason to pay more than the market wage, and if it tried to pay less, its workers would take jobs elsewhere. Therefore, the competitive firm takes the prices of its output and its inputs as given. To make its product, the firm needs two factors of production, capital and labor. As we did for the aggregate economy, we represent the firm's production technology by the production function

$Y = F(K, L)$,

where Y is the number of units produced (the firm's output), K the number of machines used (the amount of capital), and L the number of hours worked by the firm's employees (the amount of labor).The firm produces more output if it has more machines or if its employees work more hours. The firm sells its output at a price P, hires workers at a wage W, and rents capital

at a rate R. Notice that when we speak of firms renting capital, we are assuming that households own the economy's stock of capital. In this analysis, households rent out their capital, just as they sell their labor. The firm obtains both factors of production from the households that own them. The goal of the firm is to maximize profit. *Profit* is revenue minus costs. It is what the owners of the firm keep after paying for the costs of production. Revenue equals $P \times Y$, the selling price of the good P multiplied by the amount of the good the firm produces Y. Costs include both labor costs and capital costs. Labor costs equal $W \times L$, the wage W times the amount of labor L. Capital costs equal $R \times K$, the rental price of capital R times the amount of capital K. We can write

Profit = Revenue − Labor Costs − Capital Costs

$= PY - WL - RK$.

To see how profit depends on the factors of production, we use the production

function $Y = F(K, L)$ to substitute for Y to obtain

Profit $= PF(K, L) - WL - RK$.

This equation shows that profit depends on the product price P, the factor prices W and R, and the factor quantities L and K. The competitive firm takes the product price and the factor prices as given and chooses the amounts of labor.

The Firm's Demand for Factors

We now know that our firm will hire labor and rent capital in the quantities that maximize profit. But what are those profit-maximizing quantities? To answer this question, we first consider the quantity of labor and then the quantity of capital.

The Marginal Product of Labor

The more labor the firm employs, the more output it produces. The **marginal product of labor (*MPL*)** is the extra amount of output the firm gets from one extra unit of labor, holding the amount of capital fixed. We can express this using the production function:

$MPL = F(K, L + 1) - F(K, L)$.

The first term on the right-hand side is the amount of output produced with K units of capital and $L + 1$ units of labor; the second term is the amount of output produced with K units of capital and L units of labor. This equation states that the marginal product of labor is the difference between the amount of output produced with $L + 1$ units of labor and the amount produced with only L units of labor.

Most production functions have the property of **diminishing marginal product**. This means holding the amount of capital fixed, the marginal product of labor decreases as the amount of labor increases. Consider again the production of bread at a bakery. As a bakery hires more labor, it produces more bread. The *MPL* is the amount of extra bread produced when an extra unit of labor is hired. As more labor is added to a fixed amount of capital, however, the *MPL* falls. Fewer additional loaves are produced because workers are less productive when the kitchen is more crowded. In other words, holding the size of the kitchen fixed, each additional worker adds fewer loaves of bread to the bakery's output.

Figure 2 graphs the production function. It illustrates what happens to the amount of output when we hold the amount of capital constant and vary the amount of labor. This figure shows that the marginal product of labor is the slope of the production function. As the amount of labor increases, the production function becomes flatter, indicating diminishing marginal product.

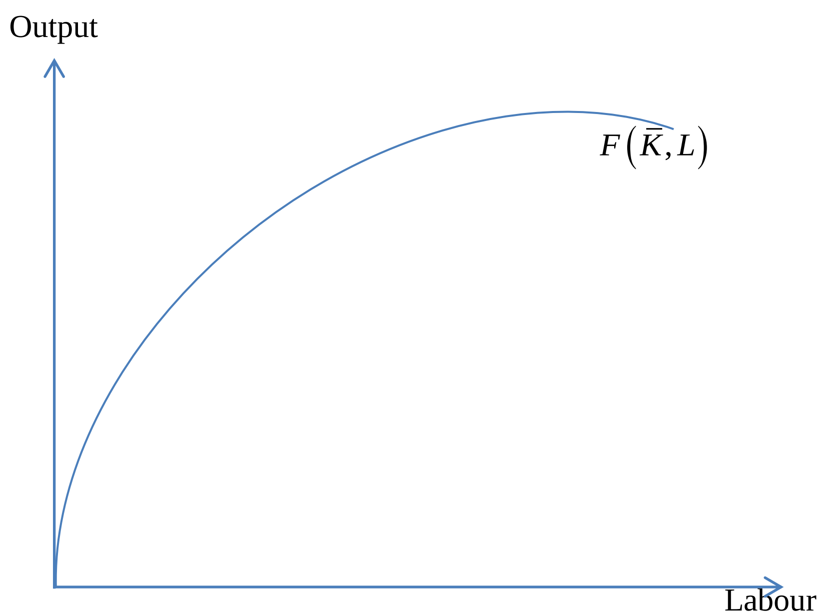

Figure-2

From the Marginal Product of Labor to Labor Demand When the competitive, profit-maximizing firm is deciding whether to hire an additional unit of labor, it considers how that decision would affect profits. It therefore compares the extra revenue from the increased production that results from the added labor to the extra cost of higher spending on wages. The increase in revenue from an additional unit of labor depends on two variables: the marginal product of labor and the price of the output. Because an extra unit of labor produces *MPL* units of output and each unit of output sells for *P* dollars, the extra revenue is $P \times MPL$.

The extra cost of hiring one more unit of labor is the wage *W*. Thus, the change in profit from hiring an additional unit of labor is

D Profit = D Revenue – D Cost

$= (P \times MPL) - W.$

The symbol D (called *delta*) denotes the change in a variable.

The Production Function This curve shows how output depends on labor input, holding the amount of capital constant. The marginal product of labor *MPL* is the change in output when the labor input is increased by one unit. As the amount of labor increases, the production function becomes flatter, indicating diminishing marginal product.

The firm's manager knows that if the extra revenue $P \times MPL$ exceeds the wage W, an extra unit of labor increases profit. Therefore, the manager continues to hire labor until the next unit would no longer be profitable—that is, until the *MPL* falls to the point where the extra revenue equals the wage. The firm's demand for labor is determined by

$P \times MPL = W.$

We can also write this as

$MPL = W/P.$

W/P is the **real wage**—the payment to labor measured in units of output rather than in dollars. To maximize profit, the firm hires up to the point at which the marginal product of labor equals the real wage.

For example, again consider a bakery. Suppose the price of bread P is \$2 per loaf, and a worker earns a wage W of \$20 per hour. The real wage W/P is 10 loaves per hour. In this example, the firm keeps hiring workers as long as each additional worker would produce at least 10 loaves per hour. When the *MPL* falls to 10 loaves per hour or less, hiring additional workers is no longer profitable.

Figure 3 shows how the marginal product of labor depends on the amount of labor employed (holding the firm's capital stock constant). That is, this figure graphs the *MPL* schedule. Because the *MPL* diminishes as the amount of labor increases, this curve slopes downward. For any given real wage, the firm hires up to the point at which the *MPL* equals the real wage. Hence, the *MPL* schedule is also the firm's labor demand curve.

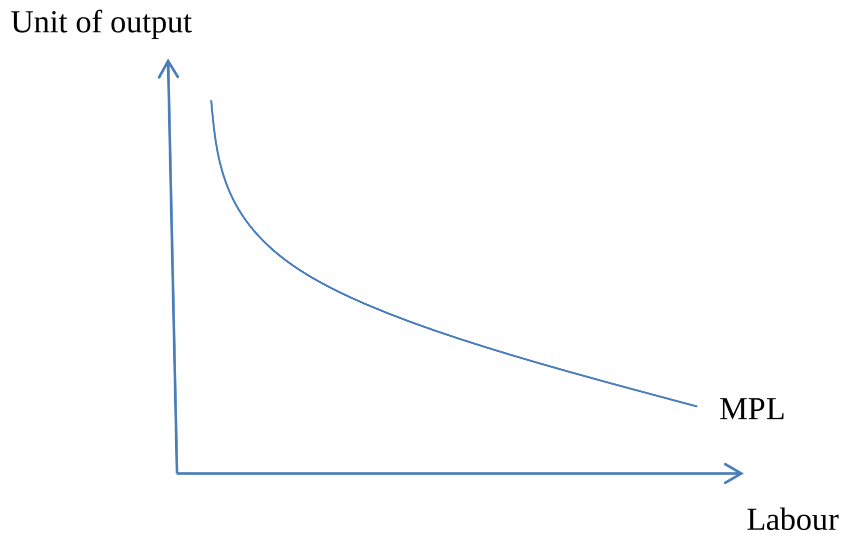

Figure-3