Laxmi Narain Dubey College, Motihari

(a constituent unit of B.R.A. Bihar University, Muz.)

NAAC Accredited 'B+'

Department of Economics

Topic: Isoquants

Paper-I: MICROECONOMICS

Part-I

B.A. (Hons.)

Instructor

Durgesh Mani Tewari

Assistant Professor

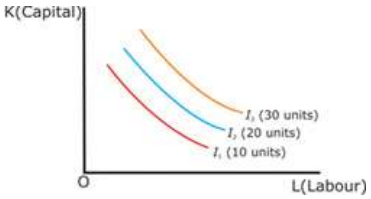
dmtewari@gmail.com

ISOQUANTS

- ✓ In order to represent the long run production function, isoquants are used.
- ✓ An isoquant depicts the various combinations of two factors of production, for example, labour and capital, using which a firm can produce the same level of output.
- ✓ It is also called an isoproduct curve or an equal product curve.
- ✓ Similar to an indifference schedule, one can have an isoquant schedule.

ASSUMPTIONS

- ✓ While constructing an isoquant, the following assumptions are made:
  1. There are only two factors of production.
  2. Technology is given.
  3. There is continuity in the production function.
- ✓ In the following figure, a set of isoquants I_1, I_2, and I_3 represent an ***isoquant map***.
- ✓ A higher isoquant, I_3 (30 units), represents a larger amount of output than the lower one, I_2 (20 units).
- ✓ A producer is indifferent among the different combinations of labour and capital, which lie on the same isoquant. While the level of output is the same along an isoquant, the capital–labour ratio differs.



CHARACTERISTICS OF ISOQUANTS

- ✓ An isoquants has the following characteristics:

1. An isoquant is negatively sloped or downward sloping (in the relevant range)

- ✓ This is because if a producer employs more than one factor, he will have to cut down on the employment of the other factor if he has to remain on the same isoquant and his level of output has to remain the same.
- ✓ This implies that the two factors can be substituted for each other.
- ✓ By analogy to the indifference curve analysis, one can prove that an isoquant does not slope upwards, is not a straight line parallel to the Y-axis and is not a straight line parallel to the X-axis. Thus, it slopes downward in the relevant range.

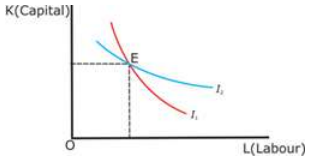
2. An isoquant is convex to the origin

- ✓ This is because the marginal rate of technical substitution diminishes as we move down an isoquant.
- ✓ The marginal rate of technical substitution is the slope of an isoquant.
- ✓ It shows the substitutability between the factors, labour, and capital.
- ✓ $MRTS_{LK}$= Slope of an isoquant = $\Delta K/\Delta L$
- ✓ The marginal rate of technical substitution of labour for capital, $MRTS_{LK}$, is the quantity of capital that a firm is ready to give up for an additional unit of labour so that the level of output remains the same.
- ✓ As the quantity of labour with the firm increases (and that of capital decreases), the MRTS of labour for capital decreases.
- ✓ A producer is found more and more unwilling to part with capital as the quantity of capital with the firm decreases.
- ✓ The reason is that, as the quantity of labour with the firm increases, there is a decrease in the marginal productivity (MP) of labour.
- ✓ Simultaneously, as the quantity of capital decreases, there is an increase in the marginal productivity of capital.
- ✓ Hence, in order to maintain a constant output, a smaller amount of capital is required to substitute every additional unit of labour. Thus, marginal rate of technical substitution diminishes.
- ✓ This can be expressed as:
- ✓ Loss in output as quantity of capital with the firm decreases = Gain in output as quantity of labour with the firm increases.

  Or, $-(MP_K)/(\Delta K) = +(MP_L)/(\Delta L)$ or, $MRTS_{LK} = \Delta K/\Delta L = MP_L/MP_K$

3. Isoquants cannot intersect each other

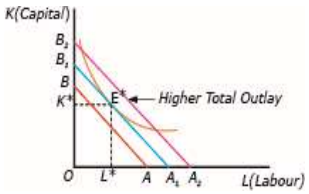
- ✓ The following figure depicts two isoquants, I_1 and I_2, which intersect at point E.
- ✓ Since point E lies on two isoquants, it implies that, with the same combination of capital and labour, a firm can produce two different output levels.
- ✓ Since this is not possible, it is obvious that two isoquants cannot intersect each other.



EXCEPTIONS

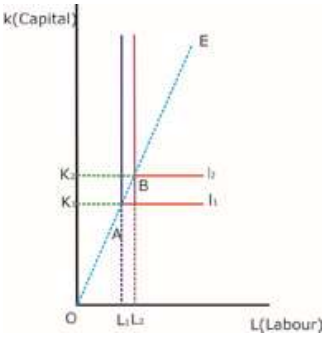
- ✓ There are certain exceptional cases as far as isoquants are concerned. These are mentioned below..

1. Isoquants are linear



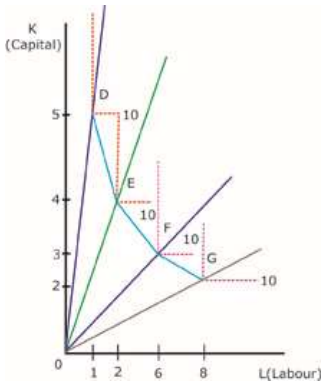
- ✓ When the factors of production, capital, and labour are perfect substitutes, the isoquant is a downward sloping straight line.
- ✓ Since the two factors are perfect substitutes, the $MRTS_{XY}$ is constant.
- ✓ For every additional unit of labour, the firm is ready to give up an equal amount of capital such that the level of output remains the same.
- ✓ Thus, to produce a good, a firm can use only capital or only labour or a combination of capital and labour.

2. Isoquants are L-shaped



- ✓ When the factors of production, capital, and labour are perfect complements, the isoquant is L-shaped.
- ✓ Since the two factors are perfect complements, the $MRTS_{XY}$ is zero. Capital and labour are used jointly in a fixed proportion to produce goods, for example, at points A and B, which represent two different levels of output.
- ✓ If the quantity of capital is increased from OK_1 to OK_2, then the quantity of labour must be increased from OL_1 to OL_2 to increase the level of output from I_1 to I_2.
- ✓ Thus, to increase the output, it is necessary that both the factors be increased proportionately. (The two factors cannot be substituted.)
- ✓ Production of the goods will occur along the ray OE, which depicts the capital labour ratio.
- ✓ It is obvious from the ray that the technological relationship, which exists between capital and labour, involves a fixed proportion of the two factors, or in other words that it is a fixed proportion production function.

3. Isoquants are kinked



- ✓ In reality, there are many techniques to produce a given level of output with each technique employing a different combination of capital and labour.
- ✓ The figure depicts an example in which to produce 10 units of goods, four techniques are available, each using a different combination of capital and labour.
- ✓ Along the ray OD, the labour–capital ratio is 1:5, along the ray OE, the ratio is 2:4 and along OF, the ratio is 6:3 and along OG, it is 8:2.
- ✓ Joining D, E, F, and G, we can obtain a kinked isoquant as in.
- ✓ It is only at combinations represented by the kinks D, E, F, and G, where it is technically possible to produce the output of 10 units of goods.
- ✓ Any other points on the isoquant, lying between the kinks D and E, E and F, and F and G are factor combinations which are not technically feasible.