Answer on Question #73899-Economics - Microeconomics

The production function for Superlite Sailboats, Inc., is

Q = 20K$^{0.5}$L$^{0.5}$

with marginal product functions

MPK=10L$^{0.5}$K$^{-0.5}$ and MPL=10K$^{0.5}$L$^{-0.5}$

a. If the price of capital is $5 per unit and the price of labor is $4 per unit, determine the expansion path for the firm.

b. The firm currently is producing 200 units of output per period using input rates of L=4 and K=25. Is this an efficient input combination? Why or why not? If not, determine the efficient input combination for producing an output rate of 200. What is the capital-labor ratio?

c. If the price of labor increases from $4 to $8 per unit, determine the efficient input combination for an output rate of 200. What is the capital-labor ratio now? What input substitution has the firm made?

Answer.

a) Expansion path is determined by the condition

$$\frac{MP_L}{MP_K} = \frac{w}{r}$$

So,

$$\frac{10L^{-0.5}K^{0.5}}{10L^{0.5}K^{-0.5}} = \frac{4}{5}$$

$$\frac{K}{L} = \frac{4}{5}$$

$$4L = 5K$$

$$L = 1.25K$$

b) It is not efficient input combination, as does not response with expansion path.

To find the efficient one let's solve the system of equations

$$200 = 20K^{0.5}L^{0.5}$$
$$L = 1.25K$$

$$200 = 20K^{0.5}(1.25K)^{0.5}$$
$$200 = 20K \times 1.12 \Rightarrow 200 = 22.4K \Rightarrow K = 8.93 \text{ , L=11.16}$$

Capital- labor ratio is

$$\frac{8.93 \times 5}{11.16 \times 4} = 1$$

c)

$$\frac{K}{L} = \frac{8}{5}$$

$$200 = 20K^{0.5}L^{0.5}$$
$$L = 0.625K$$
$$200 = 20K^{0.5}(0.625K)^{0.5}$$
$$200 = 20K \times 0.79 \Rightarrow 200 = 15.8K \Rightarrow K = 12.65 \text{ , L=7.91}$$

Capital- labor ratio is

$$\frac{12.65 \times 5}{7.91 \times 8} = 1$$

The firm increased the capital by 42% and reduced the labor by 29%.