Productivity Example Problems with Solutions

1. Long Beach Bank employs three loan officers, each working eight hours per day. Each officer processes an average of five loans per day. The bank’s payroll cost for the officers is $820 per day, and there is a daily overhead expense of $500.

a. Compute the labor productivity.

b. Compute the multifactor productivity, using loans per dollar cost as the measure.

The bank is considering the purchase of new computer software for the loan operation. The software will enable each loan officer to process eight loans per day, although the overhead expense will increase to $550.

c. Compute the new labor productivity.

d. Compute the new multifactor productivity.

e. Should the bank proceed with the purchase of the new software? Explain.

Solution

a. Labor productivity is simply the ratio of loans to labor-hours:

\[
\frac{\text{output (loans)}}{\text{input (labor-hrs.)}} = \frac{3 \text{ officers} \times 5 \text{ loans/day}}{3 \text{ officers} \times 8 \text{ hrs./day}} = 0.625 \text{ loans/labor-hr.}
\]

b. Multifactor productivity accounts for both labor cost and overhead:

\[
\frac{\text{output (loans)}}{\text{input (labor cost + overhead)}} = \frac{3 \text{ officers} \times 5 \text{ loans/day}}{\$820 + \$500} = 0.0113 \text{ loans/\$.}
\]

The new software increases the number of loans processed per day, but it also increases the overhead.

c. New labor productivity:

\[
\frac{\text{output (loans)}}{\text{input (labor-hrs.)}} = \frac{3 \text{ officers} \times 8 \text{ loans/day}}{3 \text{ officers} \times 8 \text{ hrs./day}} = 1.0 \text{ loans/labor-hr.}
\]

d. New multifactor productivity:

\[
\frac{\text{output (loans)}}{\text{input (labor cost + overhead)}} = \frac{3 \text{ officers} \times 8 \text{ loans/day}}{\$820 + \$550} = 0.0175 \text{ loans/\$.}
\]

e. Purchasing the new software would increase the labor productivity by 60 percent \((= [1.0−0.625]/0.625)\) and would increase the multifactor productivity by 55 percent \((= [0.0175 − 0.0113]/0.0113)\), so it is certainly worth the added overhead.
Modern Lumber, Inc. (MLI) produces apple crates, which it sells to growers. With the current equipment, MLI produces 240 crates per 100 logs. It currently purchases 100 logs per day, and each log requires three labor hours to process. MLI is considering the hire of a professional buyer who can buy better quality logs at the same cost. If this is the case, MLI can increase production to 260 crates per 100 logs, and the labor hours required will increase by eight hours per day (for the buyer).

a. Compute the labor productivity for the current method (i.e., no buyer).
b. What will the labor productivity be if MLI hires the professional buyer?

Suppose that MLI spends $12 per hour for each worker who constructs the crates. The buyer, however, is paid $24 per hour. The material cost is $10 per log (regardless of who purchases them).

c. Compute the multifactor productivity for the current method, using crates per dollar cost (labor + materials) as the measure.
d. How does the multifactor productivity change if the professional buyer is hired?

**Solution**

a. Labor productivity for the current method:

\[
\frac{240 \text{ crates}}{100 \text{ logs} \times 3 \text{ hrs./log}} = 0.8 \text{ crates/labor-hr.}
\]

b. Adding the labor of the buyer increases both the inputs and the outputs; the labor productivity would be:

\[
\frac{260 \text{ crates}}{(100 \text{ logs} \times 3 \text{ hrs./log}) + 8 \text{ hrs.}} = 0.844 \text{ crates/labor-hr.}
\]

This means that the labor productivity would increase by 5.5 percent (= [0.844 - 0.8]/0.8).

To combine different factors, we need a common unit of measure: in this case, dollars. The multifactor productivity measures how much output (crates) is produced per unit of input (dollars)

c. For the current method, the multifactor productivity is:

\[
\frac{240 \text{ crates}}{(100 \text{ logs} \times 3 \text{ hrs./log} \times \$12/\text{hr.}) + (100 \text{ logs} \times \$10/\text{log})} = \frac{240}{3600 + 1000} = 0.0522 \text{ crates/\$.}
\]

d. If the professional buyer is hired, the multifactor productivity would be:

\[
\frac{260 \text{ crates}}{(100 \text{ logs} \times 3 \text{ hrs./log} \times \$12/\text{hr.}) + (8 \text{ hrs.} \times \$24/\text{hr.}) + (100 \text{ logs} \times \$10/\text{log})} = \frac{260}{3600 + 192 + 1000} = 0.0543 \text{ crates/\$.}
\]

This represents an increase of 4.0 percent (= [0.0543 - 0.0522]/0.0522).