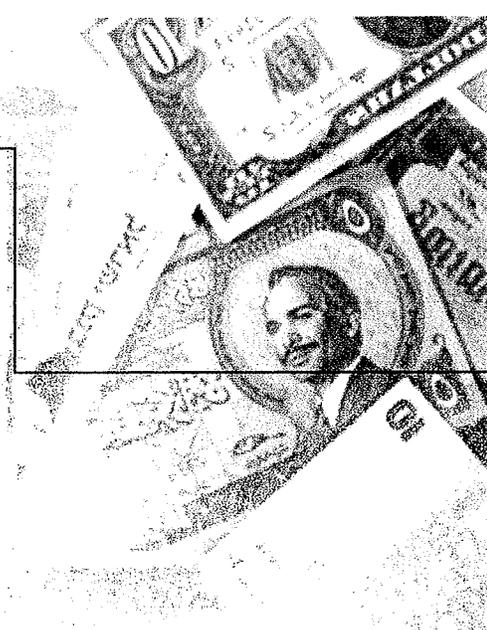


# **EXHIBIT 12**



# Microeconomics Principles and Tools

Second Edition

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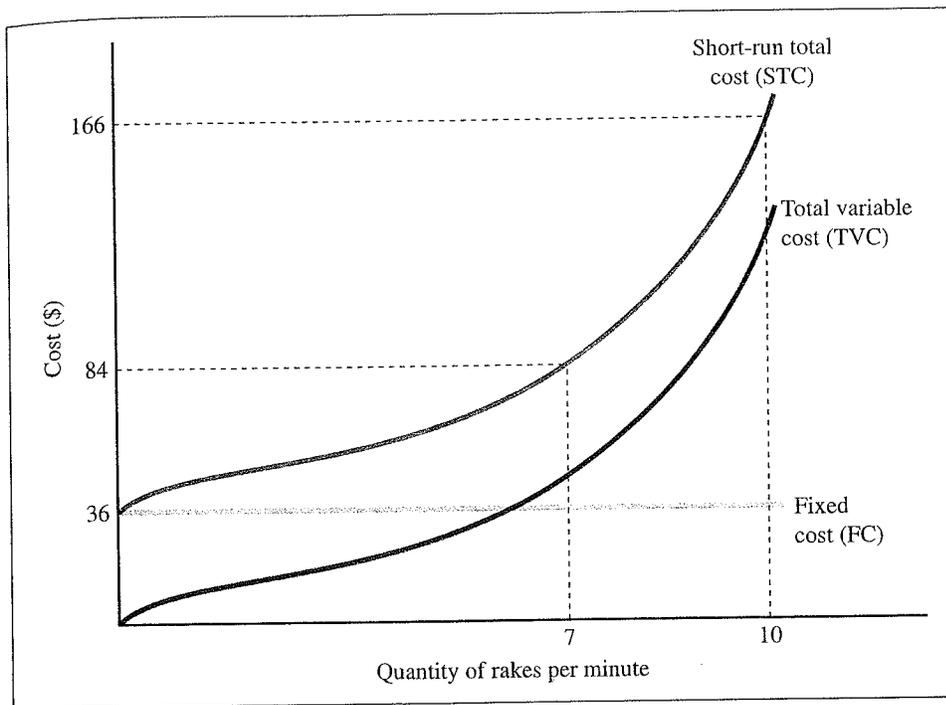
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**Figure 8.2**  
**Short-Run Cost: Fixed Cost, Variable Cost, and Total Cost**  
 The short-run total cost curve shows the relationship between the quantity of output and production costs given a fixed production facility. Short-run total cost equals fixed cost (the cost that does not vary with the quantity produced) plus total variable cost (the cost that varies with the quantity produced).

Economists like to think on the margin, and marginal cost is part of marginal thinking. The **short-run marginal cost (SMC)** is defined as the change in short-run total cost resulting from producing one more unit of the good. As shown in the fourth column of Table 8.3, if the firm decides to produce just one rake, its short-run total cost increases from \$36 (the fixed cost) to \$44, so the marginal cost of the first rake is \$8. For the first three rakes, the marginal cost gets smaller and smaller, a result of the benefits of labor specialization. The firm needs eight workers to produce the first rake (a marginal cost of \$8), but only four more workers to produce the second rake (marginal cost = \$4), and only three more workers to produce the third rake. We saw earlier that specialization leads to increasing marginal productivity; now we know that it also leads to decreasing marginal cost. In Figure 8.3, the short-run marginal-cost curve is negatively sloped for the first three rakes.

Starting with the fourth rake, the short-run marginal cost increases as the number of rakes increases, a result of diminishing returns. Once the benefits of labor specialization are exhausted, diminishing returns set in, and it takes more and more workers to increase output by one rake. To increase output from three to four rakes, the firm needs five additional workers (marginal cost = \$5, shown by point *c*). To increase output from four to five rakes, the firm needs seven additional workers (marginal cost = \$7, shown by point *d*). Because the firm requires more and more workers to increase production by one unit, the marginal cost of production increases. In Table 8.3 and Figure 8.3, marginal cost increases to \$12 for the seventh rake, to \$25 for the ninth rake, and so on.

### Short-Run Average Cost Curves

It will often be useful to express the firm's cost of production as average cost. There are three types of short-run average cost:

- **Average fixed cost (AFC):** fixed cost divided by the quantity produced.
- **Short-run average variable cost (SAVC):** total variable cost divided by the quantity produced.

**Short-run marginal cost (SMC):** The change in short-run total cost resulting from producing one more unit of the good.

**Average fixed cost (AFC):** Fixed cost divided by the quantity produced.  
**Short-run average variable cost (SAVC):** Total variable cost divided by the quantity produced.